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SURVEYING AND MAPPING is the official journal of the Congress and is published quarterly during the months of March, June, September, and December. The Congress welcomes articles and interesting news items for publication in its journal. Manuscripts should be sent to the Chairman of the Publications Committee.

For further information, write to

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DEVOTED TO THE ADVANCEMENT OF THE SCIENCES
OF SURVEYING AND MAPPING

Volume XIV, No. 2
April–June 1954

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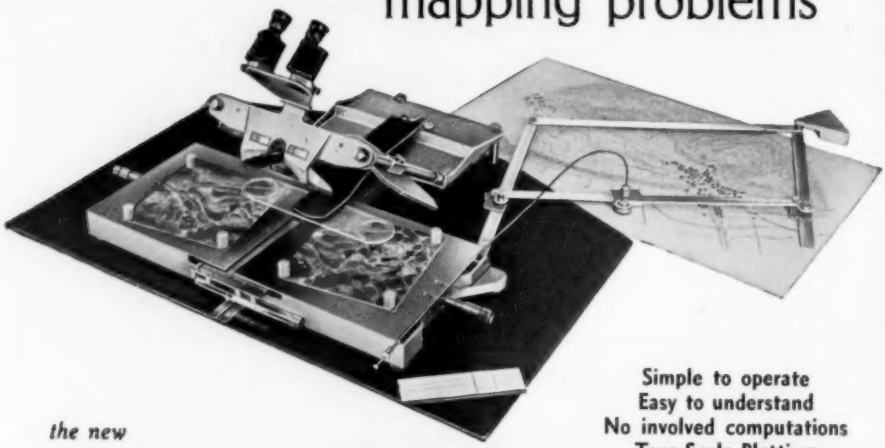

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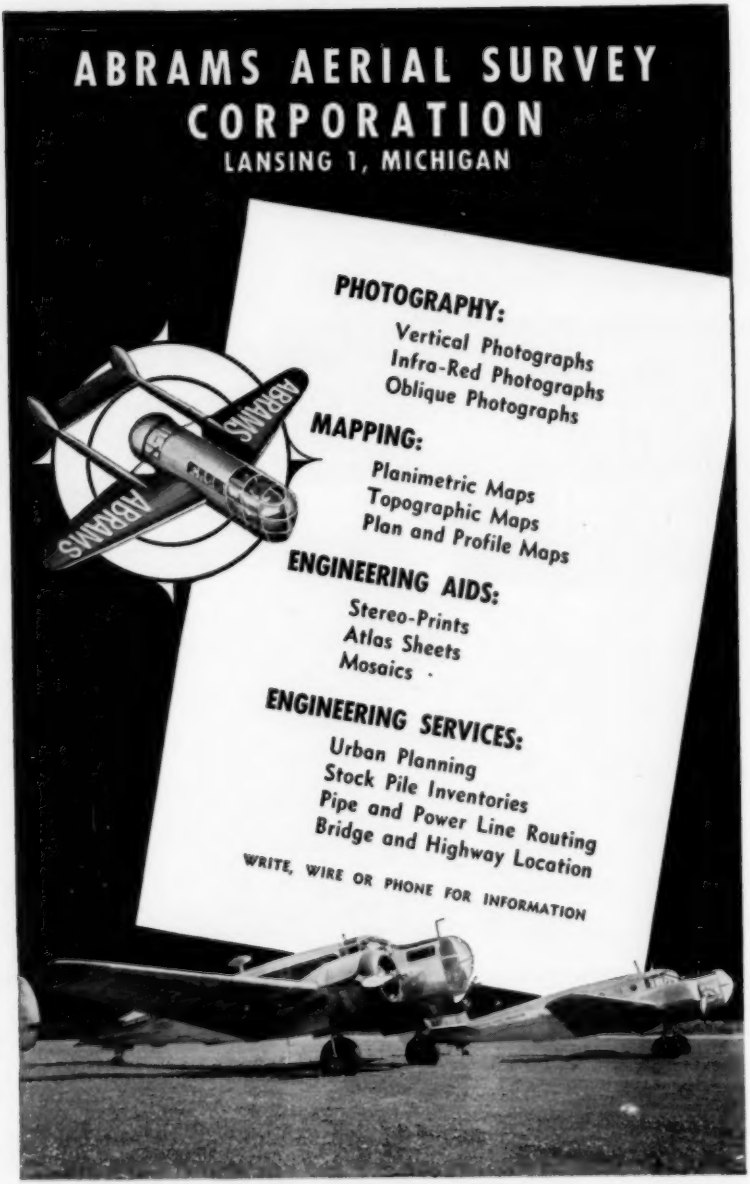
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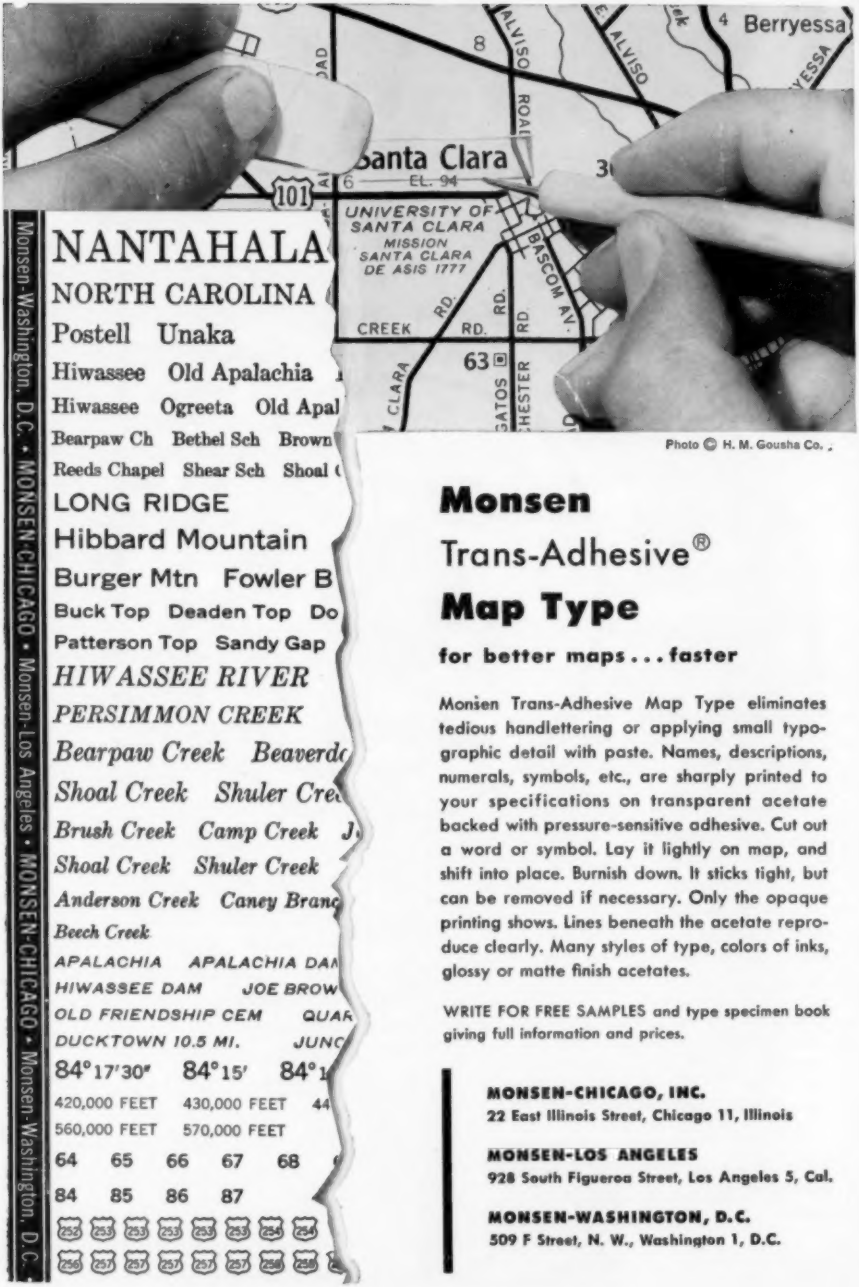

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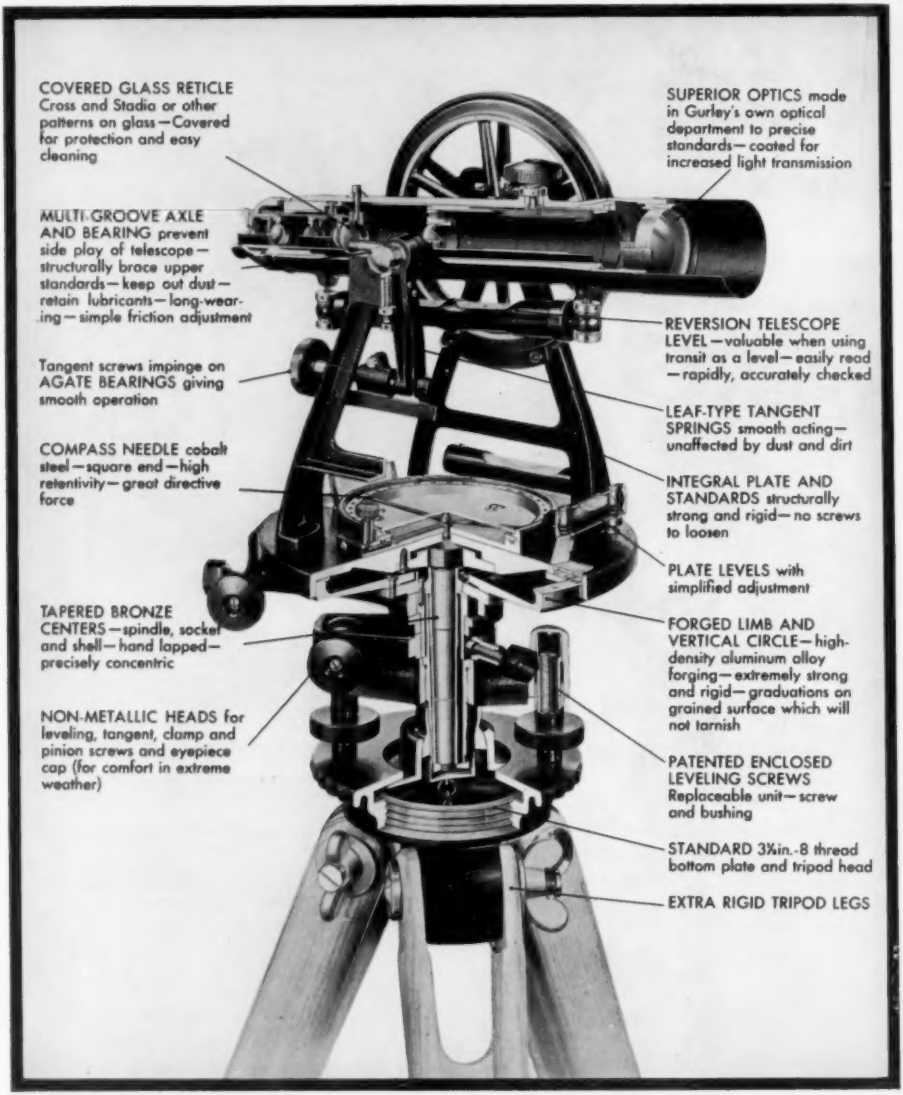
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A DISTINGUISHED GROUP OCCUPIES THE PLATFORM AT THE OPENING SESSION OF THE 14TH ANNUAL MEETING

Left to right: Carroll F. Merriam, President, American Congress on Surveying and Mapping; Dr. William E. Wrather, Director, U. S. Geological Survey; Capt. Albert J Hoskinson, Chairman, Control Surveys Division, ACSM; and the Honorable Douglas McKay, Secretary of the Interior.

The Fourteenth Annual Meeting

SOME 835 registrants from all parts of the United States and several foreign countries attended the Fourteenth Annual Meeting of the American Congress on Surveying and Mapping, held at the Shoreham Hotel, Washington, D. C., March 22–24, 1954. A lively program of technical papers, roundtable discussions, workshop demonstrations, exhibits, and social get-togethers filled the three-day calendar. For the second consecutive year, the keynote address was delivered by a member of the Cabinet of the President of the United States and was reported with other highlights of the meeting in the Washington daily newspapers. Furthermore, the activities of the ladies brought forth an approving story in the society columns of a leading Washington daily. The meeting was unquestionably a success, both from the standpoint of advancing the sciences of surveying and mapping, and of affording the opportunity for friendly, informal contact among the many members present from far and near.

As many as possible of the papers and discussions heard at the meeting will appear in this and future issues of SURVEYING AND MAPPING.

Opening of the Congress

President Carroll F. Merriam opened the exhibits officially at 10:00 a.m. on Monday. The American Congress on Surveying and Mapping was called to order an hour later for the opening session. In his opening address, entitled "Mr. Janus and His Remarkable Optical System," President Merriam described how his background affects his point of view as President of ACSM. Mr. Merriam explained that his particular field of experience places him in a position where, like Janus who faced both backwards and forwards, he can see both inwardly and outwardly in looking at the issues facing the surveying and mapping profession. Following his opening address, President Merriam introduced the keynote speaker, the Honorable Douglas McKay, Secretary of the Interior, who spoke on the theme "Surveys and Maps Prepare the Way for National Growth." In his address, Secretary McKay emphasized the importance of surveys and maps in administering and developing the natural resources of the Nation. He pointed out the enormity of the task of obtaining complete and adequate maps of the entire country. Even with the most modern procedures, he stated, it will take 30 years to complete the national topographic mapping program, and then we will have to start remapping to bring the maps up to date. At the conclusion of his remarks, Secretary McKay introduced Dr. William E. Wrather, Director of the Geological Survey. Dr. Wrather, recent winner of the John Fritz medal for his outstanding scientific achievements, presented the greetings of his agency to the meeting. (The opening address by President Merriam and the keynote address by Secretary McKay are printed elsewhere in this issue.)

The opening session was followed by a special luncheon in honor of members and guests from other countries. Canada, it was reported, had 16 representatives at the meeting. Guests were also introduced from Brazil, Colombia, Turkey, Mexico, India, Germany, the Philippine Islands, and the Canal Zone.

Plenary Sessions

President Merriam, presiding at the first plenary session on Monday afternoon, introduced Phil Miles, who read a paper prepared by Harry LaViers, Vice Chairman of the Kentucky Agricultural and Industrial Development Board, entitled "Good Maps—Can Business Afford Them?" The State of Kentucky, it was reported, is not only providing good maps, but also is making businessmen aware of their advantages. Various direct and indirect advantages of maps to business were enumerated with apt and specific cases mentioned where good maps have resulted in substantial savings in costs and have provided information not otherwise available. The conclusion of the paper answered the title question by stating that business cannot afford poor maps.

The second paper of the afternoon was given by Ralph Moore Berry, registered professional engineer and land surveyor, and former chairman of the Property Surveys Division. Mr. Berry's subject was "Compulsory Ties to State Plane Coordinates." After briefly explaining the State plane coordinate system, Mr. Berry proposed that all new surveys filed as public records should be tied to the State system, provided suitable control stations are available within a reasonable distance. He stated that the benefits from the recovery and retracement

Left to right: Carroll F. Merriam, President, American Congress on Surveying and Mapping; Dr. William E. Wrather, Director, U. S. Geological Survey; Capt. Albert J Hoskinson, Chairman, Control Surveys Division, ACSM; and the Honorable Douglas McKay, Secretary of the Interior.

standpoint would outweigh the added cost, if the lines to tie points were relatively close. Where the tie points are more distant and the cost could not be charged to the customer, Mr. Berry proposed that the surveyor be assisted by interested local agencies or by surveyors' organizations on a cooperative basis, and that in some cases the U. S. Coast and Geodetic Survey may be able to schedule work in the area to provide control points in the desired locations.

In the third paper of the session, Marshall S. Wright, former president of the Congress and now chairman of the Committee on Surveying and Mapping, U. S. Department of Agriculture Graduate School, presented a paper on "Prospects for a B.S. Degree in Surveying and Mapping." Mr. Wright discussed some of the problems, from the standpoint of both the mapmakers and the educators, involved in offering academic degrees in surveying and mapping. Courses in these subjects are noticeably absent in the curriculums of universities in the United States, and there are several administrative difficulties encountered in initiating and supporting such educational programs. He discussed some of the more important of these difficulties in the hope that mapmakers will offer ideas and suggestions for their solution.

At the second plenary session, held during the early part of the afternoon on Tuesday with President Merriam presiding, three papers were presented.

William C. Cude of the Engineer Research and Development Laboratory discussed "Military Surveying and Mapping Instrument Research." He stressed the point that for military use speed as well as accuracy is of prime importance and that for processing and reproduction work there is the added requirement of mobility. Problems of procurement as well as design were included in Mr. Cude's discussion.

Capt. Oliver S. Reading of the U. S. Coast and Geodetic Survey presented an illustrated talk on "European Developments and Practices Used in Surveying and Mapping." Among the recent developments covered by Capt. Reading's discussion were the automatic level, the geodimeter, and certain improvements in theodolite and planetable equipment. The paper also called attention to the excellent series of maps available for some European countries, discussed the methods of keeping these maps up to date, and also suggested possible ways in which the mapping situation in the United States could be improved.

Ernest J. Stocking, U. S. Civil Service Commission, gave a paper entitled "Cartographers and the Civil Service" in which he discussed in some detail the problems of the classification of civil service positions in cartography and related fields. He pointed out that, while many of these positions are not properly classifiable as "professional engineering" positions, there are both professional and sub-professional positions in the cartographic field and that the Civil Service Commission is attempting to produce revised classification standards which will recognize the professional status of surveying and mapping and be acceptable both to the Commission and to the various Federal mapping agencies.

President Merriam, presiding at the third plenary session on Wednesday afternoon, introduced, as the first speaker, Christopher M. Weld of Rand McNally and Company. In his paper entitled "Maps and Marketing Studies," Mr. Weld discussed a number of ways in which business can profitably use maps. He emphasized the importance of Census Bureau data in preparing business maps, and decried the fact that because of budgetary limitations up-to-date business or industrial statistics are not available to an adequate extent.

Dr. Francis J. Marschner, scheduled as the second speaker, unfortunately was not able to be present to discuss "The Need for a State Land-Use Map Series."

In his usual dynamic manner, Walter G. Stoneman, Chairman of the Committee on Map Use, outlined a number of ways in which ACSM members could help "sell" the public on the benefits of making wider use of existing maps and charts. He read excerpts from the constitution of ACSM to stress the responsibility of the ACSM in map education and use.

Technical Division Sessions

Each of the six technical divisions held one or more sessions for the transaction of division business, the presentation of technical papers, and the discussion of professional and technical problems. The proceedings will be reported as fully as possible in future issues of the Journal.

CARTOGRAPHY DIVISION

Chairman Arthur F. Striker opened the Cartography Division meeting on Tuesday afternoon with a brief report on divisional activities during the past year. A paper on "Negative Scribing Today" was presented by Charles F. Fuechsel in the first part of the session. His paper was in the nature of a supplement to

the panel on "Plastic or Glass Engraving Versus Drafting," a feature of the Thirteenth Annual Meeting. The new instruments and techniques described by Mr. Fuechsel were illustrated by slides and by the Geological Survey training film "Negative Scribing for Map Reproduction."

William B. Brierly opened the second part of the program with a discussion of "Geographic Considerations in the Morphology and Structure of Settlements and Urban Areas." Slides of large-scale maps showing various urban patterns illustrated Mr. Brierly's paper.

The problem of cartographic representation of urban areas on medium-scale maps designed for air use was discussed by Lt. Col. Storm C. Rhode, Jr., Deputy Chief of Staff for Operations, Headquarters, U. S. Air Force. Corresponding requirements for maps used by ground forces were described by Lt. Col. Merritt L. Hewlett, Armor G-3, Department of the Army.

CONTROL SURVEYS DIVISION

The first session of the Control Surveys Division was held on Tuesday morning with Capt. Albert J Hoskinson, Division Chairman, presiding. Capt. H. W. Hemple, Chairman of the Nominating Committee, presented the name of H. C. Fuller, Army Map Service, in nomination as a director of the Control Surveys Division for a term of 3 years. Mr. Fuller was elected by a unanimous vote. Following the business meeting, Milton E. Compton, Jr., Engineer Research and Development Laboratories, presented a paper on "Surveying With the Speed of Light." Mr. Compton discussed the geodimeter, a Swedish-developed device and method for accurately measuring distances. Tests made by ERDL and the U. S. Coast and Geodetic Survey in 1953 over measured base lines indicate an accuracy of better than 1 part in 200,000, with good repeatability. Although the observations must be made at night, an observation can be completed in from 2 to 3 hours. Following Mr. Compton's oral presentation, a movie was presented showing the setup and operation of the geodimeter in measuring a 6-mile base. After answering questions from the floor, Mr. Compton and his associates demonstrated the geodimeter and further explained its operation.

The second meeting of the Control Surveys Division, held on Wednesday morning with Chairman Hoskinson presiding, was something

A unit of the control surveys workshop in action.

new in the line of division meetings. This session was programmed as a "Control Surveys Workshop." The assemblage was divided into nine separate groups and each group of about 20 persons was directed to one of the nine sections of the workshop arranged around the perimeter of the hall.

At intervals of about 12 minutes a bell was rung and each group moved one place to the right to a new section where they remained until the next time the bell was rung. Thus each group eventually visited all nine stations and everyone had a closeup demonstration of each feature represented by the workshop. The last half hour of the period was open to permit individuals to revisit booths of particular interest for further study. The procedure was enthusiastically received and thoroughly enjoyed by those participating.

The nine subjects covered by the workshop were as follows:

1. Subtense techniques.
2. Transformation of grid coordinates.
3. Unusual problems requiring unique applications.
4. Analytics for horizontal control.
5. M–101 surveying camera.
6. Distribution of horizontal control data.
7. Distribution of vertical control data.
8. Simplified adjustment of level nets.
9. The Opton level.

This workshop was such a success that the Publications Committee plans to have it written up in considerable detail for publication in a later issue of SURVEYING AND MAPPING.

EDUCATION DIVISION

Prof. Henry B. Aikin, Chairman, presided at the Education Division session on Monday afternoon. During the business meeting, Prof. Sumner B. Irish, of Princeton University, was elected to the Executive Committee of the Division.

A discussion followed on Marshall Wright's paper, "Prospects for a B.S. Degree in Surveying and Mapping," which had been presented during the preceding Plenary Session. Prof. Lawrence Perez, Pennsylvania State College, served as moderator. Formal discussions were presented by Professor Irish, and by Prof. Frederick J. Doyle, Ohio State University. Professor Irish suggested methods for improving the educational program in surveying and mapping and explained how research work for mapping could be performed in colleges and universities. He further recommended organizing an agency for publicity in the surveying and mapping field. Professor Doyle emphasized the need for training students more thoroughly at the undergraduate level.

Further discussion was offered by Dr. W. A. Heiskanen, Ohio State University; Prof. Fred J. Spry, Cornell University; and Prof. Paul Rice of Rutgers.

A paper dealing with "Map Collections in the United States and Canada" was presented by Mrs. Marie C. Goodman, Chairman of Map Resources Committee, Special Libraries Association. In cooperation with the Special Libraries Association, the Library of Congress has prepared an inventory of map resources in this country and Canada. Mrs. Goodman reviewed this study of map resources and explained the reasons for its undertaking. She summarized the information contained in the directory and also indicated how the project should increase in scope and value.

In commenting on Mrs. Goodman's paper, Alfred C. Stiefel, U. S. Geological Survey, emphasized the importance of the map directory and expressed gratitude to Mrs. Goodman and her committee for having rendered such a valuable service. He explained how the map resources could be put to work and encouraged members of ACSM to study the directory and take a more active interest in this field.

Dr. N. L. Nicholson, representing the Geographic Branch, Dept. of Mines and Technical Surveys, Ottawa, also expressed thanks to Mrs. Goodman for having included Canada in the project.

A series of slide illustrations highlighted the final talk of the session which was given by Prof. Arthur Myer of Pennsylvania State College, who spoke on "Application of Statistical Methods to Survey Problems." Professor Myer discussed a number of problems involving survey errors using the statistical terminology which differs, as he pointed out, from the terminology used by the engineer. Professor Myer stated that statistical methods as taught in a wide variety of scientific fields provide an easily understandable approach to problems concerning errors of observations as they occur in everyday applications of elementary surveying.

INSTRUMENTS DIVISION

The meeting of the Instruments Division was held on Tuesday morning. In the absence of Chairman Louis H. Berger, Carl W. Keuffel presided. The division elected Talbert Abrams as Chairman for the coming year and re-elected

Members of ACSM listen attentively as a speaker addresses the Fourteenth Annual Meeting.

C. A. Thorpe, Jr., as Secretary. Plans for the consecutive meetings of the Congress and the American Society of Photogrammetry in March 1955 were discussed. The attendance at the meeting being rather small and many of those present being anxious to attend the concurrent meeting of the Control Surveys Division, the meeting adjourned and all trooped over to hear "Surveying With the Velocity of Light" and to see the much-talked-about geodimeter which was on display.

TOPOGRAPHY DIVISION

Division Chairman Shirley V. Griffith presided over the Topography Division meeting on Monday afternoon. The first of two scheduled subjects to be presented was "Surveys for Nautical Charts of the Aleutian Islands, and Western and Northern Alaska." This subject was arranged for three speakers, all from the U. S. Coast and Geodetic Survey. In the absence of Lt. Samuel D. Parkinson, his paper, "Air Mission," was presented by the Chairman. This paper described the aircraft, crew, and equipment used in obtaining the single- and nine-lens photographs, following which the history and geography of the area were discussed with considerable emphasis on the vastness of the area to be mapped.

The second paper was given by Bennett G. Jones on the subject, "Photogrammetric Mapping of the Coast for Charts." Mr. Jones described the establishment of photogrammetric control, the advance shoreline manuscript, the cooperation of the topographic and inshore hydrographic surveys, and the method of combining this data to provide a large part of the nautical chart.

Comdr. Gilbert R. Fish presented the third paper, "Field Surveys," explaining the geodetic and offshore hydrographic work in the area. Commander Fish described some of the surveying ships of the U. S. Coast and Geodetic Survey and their operations. Many members of the Congress were obviously surprised to learn that the USC&GS operates ships of such size and with such results. The presentation of these papers was made doubly interesting by

the inclusion of numerous slides depicting various phases of field activities.

The second scheduled subject, "Alidade Development in the Geological Survey," was presented by Calvin S. Maltby, U. S. Geological Survey. This paper covered the development of the alidade from the primitive peepsight model to the new pendulum alidade. Mr. Maltby discussed the design and construction of the reticle, the Beaman arc, and other features of the various models, with emphasis on the latest instrument, the pendulum alidade. This instrument, which promises to afford substantial economies in alidade work, will be given extensive tests this coming summer on regular field mapping work.

PROPERTY SURVEYS DIVISION

The first session of the Property Surveys Division was held on Tuesday afternoon, with Ralph M. Berry presiding at the opening of the session. Chairman Sol A. Bauer of the Nominating Committee presented the following slate of officers, who were elected by acclamation:

William B. Williams, *Chairman*
Gordon E. Ainsworth, *Vice Chairman*
Robert L. McCammon, *Secretary-Treasurer*
Frank C. Mirgain, *Editor*

Mr. Berry turned the chair over to Mr. Williams immediately following the election.

Llewellyn T. Schofield, Deputy Engineer, Land Court, Boston, Mass., presented a paper on "Land Registration and Land Court Procedures in Massachusetts." Mr. Schofield's paper was illustrated by an abundance of slides illustrating forms and procedures used in settling land questions in his State. A lively discussion followed the presentation. The discussion later turned to the pros and cons of Mr. Berry's paper on "Compulsory Ties to State Plane Coordinates" which had been presented at Monday's plenary session. There was a sharp difference of opinion on the question, chiefly on the matter of how much economic burden the surveyor and his client could bear in making the ties to coordinated control.

The second session of the Property Surveys Division was held Wednesday morning with Chairman Williams presiding. Minutes of Tuesday's meeting were read by Secretary McCammon.

A report on the progress of the Land Surveyor's Handbook was given by Sol A. Bauer. He stated that all past articles in the Journal having any connection with this Division were being reviewed on the chance that some might be considered for inclusion in the handbook. He also suggested that the book be published even if not in perfect form, as it greatest value would be in putting it into immediate use.

A proposal was submitted to the Chairman by the Texas delegation that a request be made to the Post Office Department for the issuance of a commemorative stamp in honor of the surveying profession. It was suggested that this proposal be printed in the Journal and that the Directors of ACSM carry on from there. A further suggestion was made that members aid this effort by contacting the Senators and Representatives of their home States and also by seeking the support of their local philatelic societies.

The Chairman appointed Victor Ghent as corresponding-secretary of the Division.

The only prepared paper to be given at this session was presented by Prof. R. C. Brinker, Virginia Polytechnic Institute, on the subject, "A Method for Computing Charges for Land Surveys." An interesting discussion of Professor Brinker's paper followed, with many members stating their views on this timely subject. (Professor Brinker's paper appears elsewhere in this issue.—Ed.)

Business Meeting

The annual business meeting of the Congress was held on Wednesday afternoon, with President Merriam presiding. (The proceedings are reported in full elsewhere in this issue; a brief outline is given here.)

Members of the Advisory Council, representatives of local sections, and division chairmen were introduced.

Resolutions Committee Chairman Hoskinson introduced several resolutions all of which were unanimously approved for consideration by the Board of Direction.

Brief reports were given by Sol A. Bauer, Chairman of the Professional Status Committee; M. M. Thompson, Chairman of the Publications Committee; and Capt. Frank S. Borden, Chairman of the Membership Committee. Treasurer Evans referred the Congress to the Treasurer's Annual Report as printed in the Journal.

Secretary Dix reported on the highlights of organizational activity respecting the ACSM, its divisions and sections, and affiliated groups.

In his closing message, President Merriam made reference to the plans for "Surveying Week," March 7–11, 1955, at which time the American Congress on Surveying and Mapping and the American Society of Photogrammetry will hold consecutive meetings at the Shoreham Hotel in Washington.

Exhibits

President Carroll F. Merriam officially opened the attractive array of exhibits on Monday, March 22, at 10:00 a. m. Domestic and foreign manufacturers, meeting under one roof in the spirit of good fellowship, displayed their products and services to hundreds of visitors during each day of the meeting.

A wide variety of equipment and materials used in modern surveying and mapping was exhibited in an effective and interesting manner. All exhibit booths were well patronized during the entire meeting with many instruments being demonstrated and made available for examination. The exhibits were not only of particular interest to the profession, but also afforded an excellent opportunity for the general public to gain a better understanding of the scope and importance of surveying and mapping, and to see at first hand latest instruments used in the field. The same high standards that have made ACSM exhibits a success in previous years also governed the exhibit program for the Fourteenth Annual Meeting.

The exhibit hall was open for a total of twenty-two hours during the three-day meeting. The names of organizations that sponsored exhibits are listed as follows:

Abrams Aerial Survey Corp., Lansing, Mich.
Aero Service Corp., Philadelphia, Pa.
Bausch and Lomb Optical Co., Rochester, N. Y.
C. L. Berger and Sons, Inc., Boston, Mass.
Charles Bruning Co., Inc., Chicago, Ill.
Brunson Instrument Co., Kansas City, Mo.
Ralph C. Coxhead Corp., Washington, D. C.
Eugene Dietzgen Co., Washington, D. C.
Friden Calculating Machine Co., Inc., Washington, D. C.
Geo-Optic Co., Inc., New York, N. Y.
W. & L. E. Gurley, Troy, N. Y.
Keuffel and Esser Co., Hoboken, N. J.
Kern Instruments, Inc., New York, N. Y.
Lufkin Rule Co., Saginaw, Mich.
Marchant Calculators, Inc., Oakland, Calif.
Monroe Calculating Machine Co., Orange, N. J.
Monsen—Washington, Washington, D. C.
Geo. F. Muth Co., Inc., Washington, D. C.
Universal Instruments Co., Brentwood, Md.
Wallace and Tiernan, Inc., Belleville, N. J.
David White Co., Milwaukee, Wis.
Henry Wild Surveying Instruments Supply Company of America, Inc., Port Washington, N. Y.
Zeiss Aerotopograph, Munich, Germany

In addition, several governmental agencies displayed interesting exhibits.

Social Activities, Ladies Program

Social activities, carried out according to the program, sparked the annual meeting very pleasantly. On the opening day, at a special luncheon, the introduction of members and guests from other nations attested to the spread of interest in the American Congress on Surveying and Mapping.

The entertainment of the ladies was very well provided for by a special committee of which Mrs. Ralph Berry was the efficient and untiring chairman. On Monday afternoon, a delightful tea was held in the Louis Seize Room of the Shoreham Hotel. Wives of past presidents assisted Mrs. Berry and Mrs. Carroll Merriam, wife of the current president, in receiving and introducing the many guests. During the social period, Mrs. Edward J. Foley, of Kensington, Md., presented several brilliantly executed piano solos for which she received appreciative applause. Monday evening was set aside for the traditional "Social Reconnaissance" at the Shoreham, where husbands, wives, and guests joined in meeting old friends and making new ones. Faces become more and more familiar as members return to the Annual Meeting year after year.

On Tuesday, the ladies were entertained at tea by Señora Berckemeyer, wife of the Peruvian Ambassador, at the spacious and imposing Embassy. The mansion is filled with rare and beautiful works of art which the hostess graciously described and explained in detail, making this a red-letter occasion. Tea appointments were attractive and unusual, and Señora Berckemeyer herself did the honors at the table.

Tuesday evening the annual dinner of the

Congress was held in the Terrace Banquet Room of the Shoreham Hotel. This pleasant evening of fellowship and gaiety was enjoyed by a full quota of members, wives, and guests. After the dinner, and a few words of greeting from President Merriam, Miss Ditmars of Baltimore gave a delightful series of vocal solos, which were enthusiastically applauded. Professional entertainment of music and dancing filled the following hour.

On Wednesday, the ladies were taken, by bus, to visit Arlington Cemetery and historic Mount Vernon, returning in time for an enjoyable luncheon at Collingwood Inn in Virginia, long famous for its historical associations as well as its cuisine. Others had driven down from Washington to meet the group just for the luncheon. About sixty ladies sat down together in the spacious dining rooms. This was a farewell affair at which departing Congress wives were heard making plans for the meeting in March 1955.

(Editor's Note.—We are indebted to Mrs. Frank S. Borden for this report on social activities.)

Who Did the Work?

Organizing and planning an Annual Meeting is a formidable task. General Chairman Helmuth Bay did a first-rate job in making the necessary arrangements so that everything ran smoothly. While the General Chairman, as always, bore the brunt of the burden, there are many others who contributed in large measure to the success of the meeting. Here are the Committees that collaborated to put the Fourteenth Annual Meeting across:

Helmuth Bay, *General Chairman*
Franklin G. Williams, *Vice Chairman*
Murray Y. Poling, *Consultant*
Kenneth W. Hartman, *Financial Secretary*

PROGRAM

Robert H. Randall, Jr., *Chairman*
Wallace A. Bruder, *Vice Chairman*
Ralph Moore Berry — Robert L. Moravetz
Shirley V. Griffith — Alfred C. Stiefel
Charles A. Whitten

REGISTRATION

Oscar H. Nelson, *Chairman*
Newman Bumstead, *Vice Chairman*
Charles R. Graham, *Finance*
Margaret W. Palmer, *Secretary*
Ann Embrey and Associates

REGISTRATION ASSISTANTS

Helen Fairchild — Beverly Moore
Ruth Fink — Martha C. Ott
Louise Hart — Doris A. Payne

EXHIBITS

Albert A. Stanley, *Chairman*
Paul Alexander — Guy P. Meredith
Jerome O. Kilmartin — Richard E. Niswander

ENTERTAINMENT

Franklin G. Williams, *Chairman*
Francis J. Ortiz — Murray Y. Poling

MEMBERSHIP

Frank S. Borden, *Chairman*

PUBLICITY

J. Vance Dobbin, *Chairman*

RECORD OF PROCEEDINGS

Walter S. Dix — Robert C. Eller
Morris M. Thompson

SERVICES

Projectionist—Arthur H. C. Sintzenich
Photography—Schutz Photographers
Decorations—United Nations Honor Flag Committee

LADIES PROGRAM

Mrs. Carroll F. Merriam, *Honorary Chairman*
Mrs. Ralph Moore Berry, *Chairman*
Mrs. Sol A. Bauer
Mrs. Frank S. Borden
Mrs. Walter S. Dix
Mrs. Richard T. Evans
Mrs. Gerald FitzGerald
Mrs. George H. Harding
Mrs. Chester E. Kowalczyk
Mrs. Maude K. Longaker
Mrs. Martha C. Ott
Mrs. Robert H. Randall
Mrs. Aaron L. Shalowitz
Mrs. Alfred C. Stiefel
Mrs. Robert F. A. Studds
Mrs. George D. Whitmore
Mrs. Marshall S. Wright

In addition, many individual members of the ACSM not on the formally appointed committees helped in various ways to make the meeting profitable and enjoyable. To all these people, the American Congress on Surveying and Mapping is indebted for a memorable event.

Morris M. Thompson

Mr. Janus and His Remarkable Optical System

By CARROLL F. MERRIAM

PRESIDENT, AMERICAN CONGRESS ON SURVEYING AND MAPPING

EDITOR'S NOTE.—The address which follows opened the Fourteenth Annual Meeting. Members who are not acquainted with our new President can, by reading this address, obtain some insight into the friendly and good-humored outlook which fits so well with Mr. Merriam's imposing professional and physical stature.

THE ROMANS had a god named Janus. He was a remarkable fellow. Mythological research has proved that he either was, or at least could have been, head chainman among the gods by virtue of having two faces and thus being able to aline himself perfectly between two targets.

His memory has been revered as a symbol of backsight and foresight. The month of January was named in his honor, because that is the month in which we look back on the failures of the past year, and forward to the coming year with new resolve, promptly breaking our resolutions about as soon as they are made.

I am attempting to draw an analogy between myself and Janus, but of course no analogy is ever perfect. In the first place, I am not a god, in fact not even a remarkable fellow, except in one rather obvious respect. Furthermore, I hope that I am not considered "two-faced." It is in respect to optical considerations that the analogy fits, rather than in respect to personal qualifications.

THE INWARD LOOK AND THE OUTWARD LOOK

I am not a Federal employee beyond the extent that the Coast and Geodetic Survey permits me to do a dollar's worth of work a year, at the end of which I feel, from the point of view of the satisfaction that I take in personal contacts, that I am easily the highest paid man in Washington. I have also for many years had delightful associations with other Federal bureaus, so I am in a position to look inwardly upon the fine work which these agencies are doing, and at the same time outwardly upon a map-starved public, which unfortunately does not have the perception to know that it is hungry.

As an unofficial consultant to the Maryland Bureau of Control Surveys and Maps, I can look inwardly upon the progress which Mr. Cassell and his staff are making, and at the same time outwardly upon the awakening interest that the engineers and surveyors of Maryland are taking in the work of this bureau.

My teaching experience in surveying was limited to tutoring two graduate students in order that they might forego the regular summer camp course, but I can look inwardly with sympathy and with considerable alarm at the pressure to squeeze instruction in plane surveying out of engineering courses, and outwardly to the lack of appreciation for surveying shown on the part of practicing engineers.

I am not a land surveyor, and in fact would not know how, at my age, to begin to be one, but I can look inwardly upon the progress of the Property Surveys Technical Division, and outwardly upon the tremendous potentialities for eventually liberating landowners from the encumbrance of pyramiding complications.

I am not engaged in the production of maps and charts commercially, but I see the need for improved methods and particularly a better selling job in the interest of the public itself.

As an instrumentman I have never earned more than $12 a week plus a tent over my head by night and three "cubic" meals by day, but from early experience I have re-

Presented at the Fourteenth Annual Meeting, American Congress on Surveying and Mapping, Washington, D. C., March 22–24, 1954.

tained respect and affection for fine instruments. I admire the progress that has been made since the days when the mark of excellence in a transit was the size of the plate, and the punishment it gave the back of the unfortunate who had to carry it. I can foresee further progress and look forward with interest to new developments.

After confessing the many things that I am not, you may well wonder how in the world I was ever admitted as a member of this American Congress on Surveying and Mapping. The answer is simple. For a number of years I have had the good fortune to be associated with an electric utility company president who has a keen sense of responsibility toward the public. Surveying and mapping happens to be just one of the many fields of scientific endeavor where the best interest of the company and its public meet.

JANUS' BLIND SPOTS

Returning now to further consideration of Janus' optical system, it appears that there is very little documentary evidence as to details. Some authorities contend, not without reason, that the two pairs of eyes functioned like a built-in pentaprism. Others contend that the effect was like the ordinary rear-view mirror. If so, it must have been somewhat confusing to him. We all know that the rear-view mirror is sufficient to let us know when a traffic cop is on the trail, but when we try to read signs, the lettering is wrong way around. The preponderance of opinion seems to be that Janus actually did see things correctly with his aft eyes, while some even go so far as to contend that he was able to see the entire horizon at one time. This means that he would have had the sensation of being in three dimensional space viewing it from a geometric point. Thus he would have the disturbing feeling of having become infinitesimally small. Psychologists tell us that this would be ruinous to the ego.

Another view is that he would seem to be standing at the center of a continuous panorama, and that he had equally clear vision at any azimuth. My personal opinion, for what it is worth, is that he did *not* have complete round-the-horizon vision. He may have been able to see with equal clarity at zero and at 180 degrees, but I am positive that he had blind spots at 90 and 270 degrees.

Now here is where the analogy fits. Although I claim to have been in a fortunate position to look inwardly and at the same time outwardly in several respects, there are other areas where I am particularly blind and inadept. Two of these give me particular concern at a time when I am supposed to know everybody and call everybody by name. I might as well confess at the outset, and I do this on advice of my Prime Minister, Walter Dix, that my deficient memory for names and faces has been a source of constant embarrassment. It is unfortunate that just when we need demonstration, not merely talk, about how welcome you are here, the nominating committee had to pick such a dud as I am in this respect. We can only be thankful that we do have such stand-bys as Murray Poling and Frank Williams, upon whom I am going to lean heavily.

I do ask you to take into consideration my physical limitations. I have just determined that my *HB*, height of badge, is 5.04 feet above mean floor level datum of 1954, which is not far from the *HI* of the average person. Consequently, the chances are that my badge is just about on level with your eye. Remember that my *HI* is 6.00 feet referred to the same datum, and unless I get down on my knees before you, it is difficult for me to refresh my memory. If you see me desperately squinting downward hoping to catch a few letters to give me a hint, let's be frank about it, and just raise your badge so that I can see it.

Another blind spot is caused by the fact that I have never in my life had any rank or title of distinction. Consequently, through lack of familiarity with Captains, Colonels, Doctors, Professors, and such, and their insignia, I am weak on remembering just which titles belong to which men. As a matter of fact, until I met my predecessor, my idea of an Admiral was just a particular kind of television set. Now it is too bad that we do not have in common use in

America some all-embracing term of address like "Monsieur" in French, or the convenient "Esquire" of the English. Consequently, to make sure that I don't slight anybody at the expense of honoring others, from now on I am going to address every man as "Mr.," regardless of whether I know the correct title or not. That goes too for the hero of my story, and so he is Mr. Janus, rather than God Janus.

SEEING PROBLEMS IN A NEW LIGHT

In addition to the blind spots, this honorable Mr. Janus, in my opinion at least, had areas in which vision must have been somewhat distorted by parallax. Certainly as he turned his head so that objects passed from the range of his forward eyes into the range of the aft eyes, he must have seen them from a different point of view. Now that is just about the way that I have been feeling for the past few months, as I have been brought to see many problems in a new light.

Personally I have never had to be concerned greatly with registration and licensing, for as long as I can hold my job I am not required to register. My certificate, therefore, is one of those "just in case" affairs. I had no option in the matter of social security. From birth, ethics have never bothered me, and I don't expect to indulge in competitive bidding for my services. Furthermore, I have felt that I have been blessed with a reasonably strong constitution that was not in need of being rewritten. I have been forced to form opinions on these subjects and shall present them at the business meeting on Wednesday afternoon. The point to remember, however, is that Mr. Janus' optical system, remarkable as it was, was not free from eccentricity and personal slant. The views that I shall express are strictly personal and are not to be considered the official opinion of the Congress. They are offered merely as a stimulus to consideration of matters which are to be brought to the attention of the membership.

CONTACT WITH KINDRED SOULS

I am taking this opportunity, now that you are assembled, to extend to all a personal word of welcome. I hope that you will so enjoy this Fourteenth Annual Meeting that you will look forward to our new venture, a consecutive meeting during the week of March 7, 1955, with the American Society of Photogrammetry. I believe, and I have good reason, that the initial step toward success has been the appointment of Marshall Wright, a past president of both societies, and a man of experience in the conduct of annual meetings, as the chairman of the Joint Advisory Committee. Mr. Wright's acceptance has been greeted with wide acclaim and I know that, with the wholehearted support of the many friends who have expressed approval, we have much to look forward to when we gather next year.

I should like to emphasize one more point before closing. Our committee has arranged an excellent program of technical papers, social events, and exhibits, for which we are greatly indebted. There is one element which they cannot supply, and that is your responsibility. This is a convention in the sense that it is the bringing together of people with a community of interest. Not in any way to depreciate what our speakers, our entertainers, and our exhibitors have brought, let us keep in mind that the essence of our meeting is the stimulation we receive from contact with kindred souls. Bearing in mind our common interest in professional development for the service of mankind, let us make the most of this opportunity of being together these three days.

On a mountain side at Furusund, Sweden, has been found the earliest known picture of a map compass in the whole of northern Europe. The inscription is dated July 1463, when Christian I, on his way to Finland, passed the place. His crown insignia is on top of the compass rose.—Swedish newspaper clipping submitted by Torgny Lange.

SECRETARY MCKAY CAPTIVATES HIS AUDIENCE WITH "OFF-THE-CUFF" REMARKS, AS PRESIDENT MERRIAM LOOKS ON

Surveys and Maps Prepare the Way for National Growth

By THE HONORABLE DOUGLAS McKAY
SECRETARY OF THE INTERIOR

EDITOR'S NOTE.—This is the keynote address of the Fourteenth Annual Meeting of ACSM. In addition to the prepared address printed below, Secretary McKay presented to the highly-appreciative audience an impromptu résumé of the functions and problems of various agencies of the Interior Department.

MEASUREMENT of the earth's surface by surveyors and translation of this information into maps can contribute vitally to our economic progress. We cannot, indeed, fully develop this great country of ours until we know more about it.

This audience does not need to be reminded of this. One of your aims, in fact, is to encourage basic surveying and mapping programs. Most of our citizens do not realize, however, that vast areas of the United States are still unmapped, or appreciate that the potential usefulness of these areas is therefore not fully known.

As you know, I am from Oregon. The past three decades have witnessed a rate of economic development in the West that is phenomenal, measured by almost any standard you care to choose. And there are still greater periods of achievement ahead of us. We have only developed our surface wealth, the most obvious potentials.

All of us are aware of our riches in farming and grazing land, but when it comes to estimating our national reserves of minerals, fuels, and water we have made only a cursory inventory. We shall be discovering and making *good* use of things as yet unseen for centuries to come.

MAPS PROTECT LIVES AND PROPERTY

Maps are a primary requisite before dams can be constructed or communities established. Maps are needed before industrial plants or even homes can be built on land protected legally to its owners. The development of timber, minerals, and fuels to meet our needs is dependent to a large degree on the extent of the information provided by maps. The farmer, too, needs to have security in his boundaries.

The Bureau of Land Management is responsible for making cadastral surveys of the public lands. The ownership of vast areas in the West is based on the legal evidence such work provides. In many of the surveys made years ago, no monuments were established. Many were done by contract and some frauds resulted because there was no actual check made on the work of the contractors. In many cases wooden stakes were used to mark the corners, and time and the elements have obliterated these markers.

Title to about 55 percent of the area of the 11 Western States is still vested in the Government. Since 1910, approximately 137 million acres, or 18 percent, of the total area of the States has been surveyed and the corner positions marked with iron posts. There are, nevertheless, still about 100 million acres of the public domain that have never been surveyed.

Maps have other values too—human values. In this age of air travel it is important to remember that the accuracy of a pilot's aeronautical chart depends upon up-to-date mapping.

I lost three very good friends in the tragic crash in 1947 near Lake View, Oregon. Twenty-two others have died in the Blue Mountains of Eastern Oregon—deaths that may be traceable to the lack of adequate maps. How many other lives have been

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SECRETARY MCKAY CAPTIVATES HIS AUDIENCE WITH "OFF-THE-CUFF" REMARKS, AS PRESIDENT MERRIAM LOOKS ON

lost in the United States because of mountainous areas still uncharted or poorly charted we can only guess.

THE NATIONAL TOPOGRAPHIC ATLAS

The Geological Survey has been at work since 1879 mapping the interior of our country. It has responsibility for completing the National Topographic Atlas, turning out maps at a scale of one inch to the mile for most of the country, and at a larger scale for thickly settled areas, or where greater detail is needed for special purposes.

It is altogether proper that this function should be a Federal responsibility. It is a task requiring centralized direction, precise accuracy, standardization, and authority and ability to shift work from one part of the country to another as national requirements may dictate.

Although some countries are now completely mapped, only about 1 percent of the entire world is adequately covered. Some areas, like Australia, are making rapid progress. Others are unable to get started. Recently I discussed our progress in mapping the United States with Gerald FitzGerald, who is a native Oregonian as well as past President of your Congress and Chief Topographic Engineer for the Geological Survey. He told me that it will take almost 30 years to complete the job at our present rate of progress. It will take this long, he says, in spite of all the new methods and new optical machinery that have been introduced to speed up the work.

Many of you here today have had a part in developing these new methods, such as aerial photography, that have helped lower the cost in man-hours of labor.

During the years that followed World War I, several plans were made for a long-range Federal mapping program. In 1925, Congress passed the so-called "Temple Act" which called for a generous initial appropriation to be increased annually until the job was finished. But while the Act was approved in principle, the funds for carrying out the work were never made available.

During the 75 years since the Geological Survey was established by Congress, topographic maps have been published covering about half the Nation.

Many of these are now obsolete. Much more detail and higher standards of accuracy are required. Only two States are now considered adequately mapped—Massachusetts and Rhode Island. Several others like Connecticut, New York, California, and Illinois, however, are not far behind. By 1956, Kentucky will join the top-notchers when its 5-million-dollar, 5-year cooperative program is finished.

Largely as a result of World War II, this Nation has never been so map conscious as it is now. In 1940, 704,345 topographic maps were sold by the Geological Survey. Today the figure approaches 3,000,000 annually.

A great deal of the credit for what has been accomplished and what will be done in the near future, must go to you and to the industrial concerns and State and municipal agencies you represent.

In the early thirties, Delaware, Connecticut, Maryland, New Jersey, New York, Ohio, West Virginia, the District of Columbia, and the Hawaiian Islands were completely covered by maps considered adequate at that time. These maps have already become obsolete. Fortunately, we can be sure that this will not happen to maps we are making today, for they are being turned out in greater detail and at a larger scale. We are also much better equipped today than we were earlier, not only to estimate future needs but to keep our modern maps up to date.

RATE OF PRODUCTION OF TOPOGRAPHIC MAPS

Before 1948, Geological Survey topographers struggled to approach a goal of 300 maps a year. In the fiscal year 1952 they produced 897. Last year they turned out 1,452. And by the end of this fiscal year it is estimated that more than 1,900 will have come off the presses.

Since two Geological Survey topographers first started mapping in Arizona on July 16, 1879, more than 15,000 topographic maps have been turned out by that agency.

Today, work on approximately 7,000 new or revised quadrangles is in progress. These will be published as time and funds permit. Altogether, the American public already has access to a stock of more than 25,000,000 sheets.

Our long-range goal is to complete the National Topographic Atlas and to produce more maps and better maps, faster, and at lower cost. At the same time, it is essential to conduct an educational program to let the public know the wealth of information provided by maps that are already available. I note with pleasure that this is one of the worthy aims of this association—"to contribute to public education in the use of surveys and maps."

I congratulate you on your success in carrying this program forward.

Permit me also, in conclusion, to invite each of you to visit any of the Department's surveying or map-making or map-using agencies. I am sure that your professional colleagues in our agencies, who share so many mutual interests with you, will give you a most cordial welcome.

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The Postman Rang Once—He Knew His Coordinates

OUR post office workers continually amaze with their ability to decipher garbled names and addresses, but they top their own accomplishments when they indicate familiarity with the California Coordinate System.

That is, you may remember from an explanation printed herein a few days ago, the plan set up by the United States Coast and Geodetic Survey to help engineers and surveyors to designate the exact location of any point.

From a base point far out in the Pacific, any spot can be established as so many feet north (indicated by y) and so many feet east (indicated by x) of the base.

So when the East Bay Council on Surveying and Mapping, which thinks highly of the coordinate system, decided to hold a meeting on February 11, it sent out notices to members, announcing the place for the meeting would be $y = 465{,}821$, $x = 1{,}496{,}390$.

Surveyors and mappers should be expected to know what the designation meant. But apparently the association takes no chances.

The meeting notice carries a footnote: "The point designated by these coordinates is in the council chambers of the Alameda City Hall, Oak St. and Santa Clara Ave., Alameda."

And because The Knave had indicated an interest, a copy of the notice was mailed to me. It was placed in an envelope addressed: "$y = 479{,}337.85$, $x = 1{,}488{,}706.27$, California Coordinate System, Zone 3."

But there was no help for the post office. No footnote, no explanation at all.

Yet the letter was delivered promptly and to the right spot.

This proves, no doubt, that mailmen are smarter than surveyors.

Reprinted from "Daily Knave," a regular feature of the *Oakland Tribune,* Feb. 2, 1954.

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Texas Surveyors Think Well of ACSM

THE January 29, 1954, issue of the *News Letter* of the Texas Surveyors Association, in speaking of the ACSM, states that "This national organization, now in its 14th year, has made what is probably the most valuable contribution to the advancement of the fields of surveying and mapping during this century. Its quarterly journal is the most complete and informative of its kind now published anywhere and the programs and exhibits carried at the annual meetings are of a scope and quality commensurate with the international recognition that the organization has achieved."

The ACSM is honored to be so recognized by the Texas Surveyors Association. This Texas organization of 400 members, with confident plans of doubling that number before the end of the year, and with an ambitious and aggressive program for 1954, is a progressive and noteworthy force for advancing the interests of the surveying profession in Texas.

I hold every man a debtor to his profession; from the which as men of course do seek to receive countenance and profit, so ought they of duty to endeavour themselves by way of amends, to be a help and ornament thereunto.

SIR FRANCIS BACON

The Judicial Functions of Surveyors[1]

By THOMAS M. COOLEY

CHIEF JUSTICE, SUPREME COURT OF MICHIGAN, 1864–1885

WHEN a man has had a training in one of the exact sciences, where every problem within its purview is supposed to be susceptible of accurate solution, he is likely to be not a little impatient when he is told that, under some circumstances, he must recognize inaccuracies, and govern his action by facts which lead him away from the results which theoretically he ought to reach. Observation warrants us in saying that this remark may frequently be made of surveyors.

In the State of Michigan, all our lands are supposed to have been surveyed once or more, and permanent monuments fixed to determine the boundaries of those who should become proprietors. The United States, as original owner, caused them all to be surveyed once by sworn officers, and as the plan of subdivision was simple, and was uniform over a large extent of territory, there should have been, with due care, few or no mistakes; and long rows of monuments should have been perfect guides to the place of any one that chanced to be missing. The truth, unfortunately, is that the lines were very carelessly run, the monuments inaccurately placed; and, as the record witnesses to these were many times wanting in permanency, it is often the case that when the monument was not correctly placed, it is impossible to determine by the record, by the aid of anything on the ground, where it was located. The incorrect record of course becomes worse than useless when the witnesses it refers to have disappeared.

It is, perhaps, generally supposed that our town plats were more accurately surveyed, as indeed they should have been, for in general there can have been no difficulty in making them sufficiently perfect for all practical purposes. Many of them, however, were laid out in the woods; some of them by proprietors themselves, without either chain or compass, and some by imperfectly trained surveyors, who, when land was cheap, did not appreciate the importance of having correct lines to determine boundaries when land should become dear. The fact probably is that town surveys are quite as inaccurate as those made under authority of the general government.

RECOVERING LOST CORNERS

It is now upwards of fifty years since a major part of the public surveys in what is now the State of Michigan were made under authority of the United States. Of the lands south of Lansing, it is now forty years since the major part were sold and the work of improvement begun. A generation has passed away since they were converted into cultivated farms, and few if any of the original corner and quarter stakes now remain.

The corner and quarter stakes were often nothing but green sticks driven into the ground. Stones might be put around or over these if they were handy, but often they were not, and the witness trees must be relied upon after the stake was gone. Too often the first settlers were careless in fixing their lines with accuracy while monuments remained, and an irregular brush fence, or something equally untrustworthy, may have been relied upon to keep in mind where the blazed line once was. A fire running through this might sweep it away, and if nothing was substituted in its place, the adjoining proprietors might in a few years be found disputing over their lines, and per-

[1] This article appeared originally in the Michigan Engineering Society Journal (University of Michigan). It is reprinted in response to numerous requests for the full text following publication of the article, "Land Survey Problems in the Florida Keys," by John P. Goggin, in the July–Sept. 1953 issue of SURVEYING AND MAPPING. Mr. Goggin's article makes frequent allusion to the article presented here.

haps rushing into litigation, as soon as they had occasion to cultivate the land along the boundary.

If now the disputing parties call in a surveyor, it is not likely that any one summoned would doubt or question that his duty was to find, if possible, the place of the original stakes which determined the boundary line between the proprietors. However erroneous may have been the original survey, the monuments that were set must nevertheless govern, even though the effect be to make one half-quarter section 90 acres and the one adjoining, 70; for parties buy, or are supposed to buy, in reference to these monuments, and are entitled to what is within their lines, and no more, be it more or less. While the witness trees remain, there can generally be no difficulty in determining the locality of the stakes.

When the witness trees are gone, so that there is no longer record evidence of the monuments, it is remarkable how many there are who mistake altogether the duty that now devolves upon the surveyor. It is by no means uncommon that we find men, whose theoretical education is thought to make them experts, who think that when the monuments are gone the only thing to be done is to place new monuments where the old ones should have been, and would have been if placed correctly. This is a serious mistake. The problem is now the same that it was before: to ascertain by the best lights of which the case admits, where the original lines were. The mistake above alluded to is supposed to have found expression in our legislation; though it is possible that the real intent of the act to which we shall refer is not what is commonly supposed.

An act passed in 1869 (Compiled Laws, 593) amending the laws respecting the duties and powers of county surveyors, after providing for the case of corners which can be identified by the original field notes or other unquestionable testimony, directs as follows:

Second. Extinct interior section corners must be reestablished at the intersection of two right lines joining the nearest known points on the original section lines east and west and north and south of it.

Third. Any extinct quarter-section corner, except on fractional lines, must be reestablished equidistant and in a right line between the section corners; in all other cases at its proportionate distance between the nearest original corners on the same line.

The corners thus determined, the surveyors are required to perpetuate by noting bearing trees when timber is near.

To estimate properly this legislation, we must start with the admitted and unquestionable fact that each purchaser from government bought such land as was within the original boundaries, and unquestionably owned it up to the time when the monuments became extinct. If the monument was set for an interior section corner, but did not happen to be "at the intersection of two right lines joining the nearest known points on the original section lines east and west and north and south of it," it nevertheless determined the extent of his possessions, and he gained or lost according as the mistake did or did not favor him.

EXTINCT CORNERS

It will probably be admitted that no man loses title to his land or any part thereof merely because the evidences become lost or uncertain. It may become more difficult for him to establish it as against an adverse claimant, but theoretically the right remains; and it remains as a potential fact so long as he can present better evidence than any other person. And it may often happen that notwithstanding the loss of all trace of a section corner or quarter stake, there will still be evidence from which any surveyor will be able to determine with almost absolute certainty where the original boundary was between the government subdivisions.

There are two senses in which the word extinct may be used in this connection: One, the sense of physical disappearance; the other, the sense of loss of all reliable evidence. If the statute speaks of extinct corners in the former sense, it is plain that a serious mistake was made in supposing that

surveyors could be clothed with authority to establish new corners by an arbitrary rule in such cases. As well might the statute declare that, if a man loses his deed, he shall lose his land altogether.

But if by extinct corner is meant one in respect to the actual location of which all reliable evidence is lost, then the following remarks are pertinent:

1. There would undoubtedly be a presumption in such a case that the corner was correctly fixed by the government surveyor where the field notes indicated it to be.

2. But this is only a presumption, and may be overcome by any satisfactory evidence showing that in fact it was placed elsewhere.

3. No statute can confer upon a county surveyor the power to "establish" corners, and thereby bind the parties concerned. Nor is this a question merely of conflict between State and Federal law; it is a question of property right. The original surveys must govern, and the laws under which they were made govern, because the land was bought in reference to them; and any legislation, whether State or Federal, that should have the effect to change these, would be inoperative, because of the disturbance to vested rights.

4. In any case of disputed lines, unless the parties concerned settle the controversy by agreement, the determination of it is necessarily a judicial act, and it must proceed upon evidence and give full opportunity for a hearing. No arbitrary rules of survey or of evidence can be laid down whereby it can be adjudged.

THE FACTS OF POSSESSION

The general duty of a surveyor in such a case is plain enough. He is not to assume that a monument is lost until after he has thoroughly sifted the evidence and found himself unable to trace it. Even then he should hesitate long before doing anything to the disturbance of settled possessions. Occupation, especially if long continued, often affords very satisfactory evidence of the original boundary when no other is attainable; and the surveyor should inquire when it originated, how, and why the lines were then located as they were, and whether a claim of title has always accompanied the possession, and give all the facts due force as evidence. Unfortunately, it is known that surveyors sometimes, in supposed obedience to the State statute, disregard all evidences of occupation and claim of title and plunge whole neighborhoods into quarrels and litigation by assuming to "establish" corners at points with which the previous occupation cannot harmonize. It is often the case that, where one or more corners are found to be extinct, all parties concerned have acquiesced in lines which were traced by the guidance of some other corner or landmark, which may or may not have been trustworthy; but to bring these lines into discredit, when the people concerned do not question them, not only breeds trouble in the neighborhood, but it must often subject the surveyor himself to annoyance and perhaps discredit, since in a legal controversy the law as well as common sense must declare that a supposed boundary line long acquiesced in is better evidence of where the real line should be than any survey made after the original monuments have disappeared. (*Stewart* v. *Carleton,* 31 Mich. Reports, 270; *Diehl* v. *Zanger,* 39 Mich. Reports, 601.) And county surveyors, no more than any others, can conclude parties by their surveys.

The mischiefs of overloking the facts of possession most often appear in cities and villages. In towns the block and lot stakes soon disappear; there are no witness trees, and no monuments to govern except such as have been put in their places, or where their places were supposed to be. The streets are likely to be soon marked off by fences, and the lots in a block will be measured off from these, without looking farther. Now it may perhaps be known in a particular case that a certain monument still remaining was the starting point in the original survey of the town plat; or a surveyor settling in the town may take some central point as the point of departure in his surveys and, assuming the original plat to be accurate, he will then undertake to find all streets and all lots by course and distance according to the plat, measuring and estimating from his point of departure. This procedure might unsettle every line and every monument existing by acquiescence in the town; it would be very likely

to change the lines of streets, and raise controversies everywhere. Yet this is what is sometimes done; the surveyor himself being the first person to raise the disturbing questions.

Suppose, for example, a particular village street has been located by acquiescence and used for many years, and the proprietors in a certain block have laid off their lots in reference to this practical location. Two lot owners quarrel, and one of them calls in a surveyor, that he may make sure his neighbor shall not get an inch of land from him. This surveyor undertakes to make his survey accurate, whether the original was so or not, and the first result is, he notifies the lot owners that there is error in the street line, and that all fences should be moved, say 1 foot to the east. Perhaps he goes on to drive stakes through the block according to this conclusion. Of course, if he is right in doing this, all lines in the village will be unsettled; but we will limit our attention to the single block. It is not likely that the lot owners generally will allow the new survey to unsettle their possessions, but there is always a probability of finding some one disposed to do so. We shall then have a lawsuit; and with what result?

FIXING LINES BY ACQUIESCENCE

It is a common error that lines do not become fixed by acquiescence in a less time than 20 years. In fact, by statute, road lines may become conclusively fixed in 10 years; and there is no particular time that shall be required to conclude private owners, where it appears that they have accepted a particular line as their boundary, and all concerned have cultivated and claimed up to it. Public policy requires that such lines be not lightly disturbed, or disturbed at all after the lapse of any considerable time. The litigant, therefore, who in such a case pins his faith on the surveyor is likely to suffer for his reliance, and the surveyor himself to be mortified by a result that seems to impeach his judgment.

Of course, nothing in what has been said can require a surveyor to conceal his own judgment, or to report the facts one way when he believes them to be another. He has no right to mislead, and he may rightfully express his opinion that an original monument was at one place, when at the same time he is satisfied that acquiescence has fixed the rights of parties as if it were at another. But he would do mischief if he were to attempt to "establish" monuments which he knew would tend to disturb settled rights; the farthest he has a right to go, as an officer of the law, is to express his opinion where the monument should be, at the same time that he imparts the information to those who employ him and who might otherwise be misled, that the same authority that makes him an officer and entrusts him to make surveys, also allows parties to settle their own boundary lines, and considers acquiescence in a particular line or monument, for any considerable period, as strong if not conclusive evidence of such settlement. The peace of the community absolutely requires this rule. It is not long since, that in one of the leading cities of the State, an attempt was made to move houses 2 or 3 rods into the street, on the ground that a survey under which the street had been located for many years had been found on a more recent survey to be erroneous.

THE DUTY OF THE SURVEYOR

From the foregoing, it will appear that the duty of the surveyor where boundaries are in dispute must be varied by the circumstances.

1. He is to search for original monuments, or for the places where they were originally located, and allow these to control if he finds them, unless he has reason to believe that agreements of the parties, express or implied, have rendered them unimportant. By monuments, in the case of government surveys, we mean, of course, the corner and quarter stakes. Blazed lines or marked trees on the lines are not monuments; they are merely guides or finger posts, if we may use the expression, to inform us with more or less accuracy where the monuments may be found.

2. If the original monuments are no longer discoverable, the question of location becomes one of evidence merely. It is merely idle for any State statute to direct a surveyor to locate

or "establish" a corner, as the place of the original monument, according to some inflexible rule. The surveyor, on the other hand, must inquire into all the facts, giving due prominence to the acts of parties concerned, and always keeping in mind, first, that neither his opinion nor his survey can be conclusive upon parties concerned, and, second, that courts and juries may be required to follow after the surveyor over the same ground, and that it is exceedingly desirable that he govern his action by the same lights and the same rules that will govern theirs.

It is always possible, when corners are extinct, that the surveyor may usefully act as a mediator between parties and assist in preventing legal controversies by settling doubtful lines. Unless he is made for this purpose an arbitrator by legal submission, the parties, of course, even if they consent to follow his judgment, cannot, on the basis of mere consent, be compelled to do so; but if he brings about an agreement, and they carry it into effect by actually conforming their occupation to his lines, the action will conclude them. Of course, it is desirable that all such agreements be reduced to writing, but this is not absolutely indispensable if they are carried into effect without.

MEANDER LINES

The subject of meander lines is taken up with some reluctance because it is believed the general rules are familiar. Nevertheless, it is often found that surveyors misapprehend them, or err in their application; and as other interesting topics are somewhat connected with this, a little time devoted to it will probably not be altogether lost. These are lines traced along the shores of lakes, ponds, and considerable rivers, as the measures of quantity when sections are made fractional by such waters. These have determined the price to be paid when government lands were bought, and perhaps the impression still lingers in some minds that the meander lines are boundary lines, and that all in front of them remains unsold. Of course this is erroneous. There was never any doubt that, except on the large navigable rivers, the boundary of the owners of the banks is the middle line of the river; and while some courts have held that this was the rule on all fresh-water streams, large and small, others have held to the doctrine that the title to the bed of the stream below low-water mark is in the State, while conceding to the owners of the banks all riparian rights. The practical difference is not very important. In this State, the rule that the centerline is the boundary line is applied to all our great rivers, including the Detroit, varied somewhat by the circumstance of there being a distinct channel for navigation, in some cases, with the stream in the main shallow, and also sometimes by the existence of islands.

The troublesome questions for surveyors present themselves when the boundary line between two contiguous estates is to be continued from the meander line to the centerline of the river. Of course, the original survey supposes that each purchaser of land on the stream has a water front of the length shown by the field notes; and it is presumable that he bought this particular land because of that fact. In many cases it now happens that the meander line is left some distance from the shore by the gradual change of course of the stream, or diminution of the flow of water. Now the dividing line between two government subdivisions might strike the meander line at right angles, or obliquely; and, in some cases, if it were continued in the same direction to the centerline of the river, might cut off from the water one of the subdivisions entirely, or at least cut it off from any privilege of navigation or other valuable use of the water, while the other might have a water front much greater than the length of a line crossing it at right angles to its side lines. The effect might be that, of two government subdivisions of equal size and cost, one would be of great value as water-front property, and the other comparatively valueless. A rule which would produce this result would not be just, and it has not been recognized in the law.

Nevertheless it is not easy to determine what ought to be the correct rule for every case. If the river has a straight course, or

one nearly so, every man's equities will be preserved by this rule: Extend the line of division between the two parcels from the meander line to the centerline of the river, as nearly as possible at right angles to the general course of the river at that point. This will preserve to each man the water front which the field notes indicated, except as changes in the water may have affected it, and the only inconvenience will be that the division line between different subdivisions is likely to be more or less deflected where it strikes the meander line.

This is the legal rule, and is not limited to government surveys, but applies as well to water lots which appear as such on town plats. (*Bay City Gas Light Co.* v. *The Industrial Works,* 28 Mich. Reports, 182.) It often happens, therefore, that the lines of city lots bounded on navigable streams are deflected as they strike the bank, or the line where the bank was when the town was first laid out.

IRREGULAR WATERCOURSES

When the stream is very crooked, and especially if there are short bends, so that the foregoing rule is incapable of strict application, it is sometimes very difficult to determine what shall be done; and in many cases the surveyor may be under the necessity of working out a rule for himself. Of course his action cannot be conclusive; but if he adopts one that follows, as nearly as the circumstances will admit, the general rule above indicated, so as to divide as near as may be the bed of the stream among the adjoining owners in proportion to their lines upon the shore, his division, being that of an expert, made upon the ground, and with all available lights, is likely to be adopted as law for the case. Judicial decisions, into which the surveyor would find it prudent to look under such circumstances, will throw light upon his duties and may constitute a sufficient guide when peculiar cases arise. Each riparian lot owner ought to have a line on the legal boundary, namely, the centerline of the stream, proportioned to the length of his line on the shore, and the problem in each case is how this is to be given him. Alluvion—when a river imperceptibly changes its course—will be apportioned by the same rules.

The existence of islands in a stream when the middle line constitutes a boundary, will not affect the apportionment unless the islands were surveyed out as government subdivisions in the original admeasurement. Wherever that was the case, the purchaser of the island divides the bed of the stream on each side with the owner of the bank, and his rights also extend above and below the solid ground, and are limited by the peculiarities of the bed and the channel. If an island was not surveyed as a government subdivision previous to the sale of the bank, it is, of course, impossible to do this for the purposes of government sale afterward, for the reason that the rights of the bank owners are fixed by their purchase; when making that, they have a right to understand that all land between the meander lines, not separately surveyed and sold, will pass with the shore in the government sale and, having this right, anything which their purchase would include under it cannot afterward be taken from them. It is believed, however, that the Federal courts would not recognize the applicability of this rule to large navigable rivers, such as those uniting the Great Lakes.

On all the little lakes of the State which are mere expansions near their mouths of the rivers passing through them—such as the Muskegon, Pere Marquette, and Manistee—the same rule of bed ownership has been judicially applied that is applied to the rivers themselves; and the division lines are extended under the water in the same way. (*Rice* v. *Ruddiman,* 10 Mich., 125.) If such a lake were circular, the lines would converge to the center; if oblong or irregular, there might be a line in the middle on which they would terminate whose course would bear some relation to that of the shore. But it can seldom be important to follow the division line very far under the water, since all private rights are subject to the public rights of navigation and other use, and any private use of the lands inconsistent with these would be a nuisance,

and punishable as such. It is sometimes important, however, to run the lines out for considerable distance in order to determine where one may lawfully moor vessels or rafts for the winter or cut ice. The ice crop that forms over a man's land of course belongs to him. (*Lorman* v. *Benson,* 8 Mich., 18; *People's Ice Co.* v. *Steamer Excelsior,* recently decided.)

MEANDER LINES AND RIPARIAN RIGHTS

What is said above will show how unfounded is the notion, which is sometimes advanced, that a riparian proprietor on a meandered river may lawfully raise the water in the stream without liability to the proprietors above, provided he does not raise it so that it overflows the meander line. The real fact is that the meander line has nothing to do with such a case, and an action will lie whenever he sets back the water upon the proprietor above, whether the overflow be below the meander lines or above them.

As regards the lakes and ponds of the State, one may easily raise questions that it would be impossible for him to settle. Let us suggest a few questions, some of which are easily answered, and some not:

1. To whom belongs the land under these bodies of water, where they are not mere expansions of a stream flowing through them?
2. What public rights exist in them?
3. If there are islands in them which were not surveyed out and sold by the United States, can this be done now?

Others will be suggested by the answers given to these.

It seems obvious that the rules of private ownership which are applied to rivers cannot be applied to the great lakes. Perhaps it should be held that the boundary is at low water mark, but improvements beyond this would only become unlawful when they became nuisances. Islands in the great lakes would belong to the United States until sold, and might be surveyed and measured for sale at any time. The right to take fish in the lakes, or to cut ice, is public like the right of navigation, but is to be exercised in such manner as not to interfere with the rights of shore owners. But so far as these public rights can be the subject of ownership, they belong to the State, not to the United States, and so, it is believed, does the bed of a lake also. (*Pollord* v. *Hagan,* 3 Howard's U. S. Reports.) But such rights are not generally considered proper subjects of sale, but like the right to make use of the public highways, they are held by the State in trust for all the people.

What is said of the large lakes may perhaps be said also of the interior lakes of the State, such, for example, as Houghton, Higgins, Cheboygan, Burt's Mullet, Whitmore, and many others. But there are many little lakes or ponds which are gradually disappearing, and the shore proprietorship advances *pari passu* as the waters recede. If these are of any considerable size—say, even a mile across—there may be questions of conflicting rights which no adjudication hitherto made could settle. Let any surveyor, for example, take the case of a pond of irregular form, occupying a square mile or more of territory, and undertake to determine the rights of the shore proprietors to its bed when it shall totally disappear, and he will find he is in the midst of problems such as probably he has never grappled with or reflected upon before. But the general rules for the extension of shore lines, which have already been laid down, should govern such cases, or at least should serve as guides in their settlement.

Where a pond is so small as to be included within the lines of a private purchase from the government, it is not believed the public have any rights in it whatever. Where it is not so included, it is believed they have rights of fishery, rights to take ice and water, and rights of navigation for business and pleasure. This is the common belief, and probably the just one. Shore rights must not be so exercised as to disturb these, and the States may pass all proper laws for their protection. It would be easy with suitable legislation to preserve these little bodies of water as permanent places of resort for the pleasure and recrea-

tion of the people, and there ought to be such legislation.

If the State should be recognized as owner of the beds of these small lakes and ponds, it would not be owner for the purpose of selling. It would be owner only as trustee for the public use; and a sale would be inconsistent with the right of the bank owners to make use of the water in its natural condition in connection with their estates. Some of them might be made salable lands by draining; but the State could not drain, even for this purpose, against the will of the shore owners, unless their rights were appropriated and paid for.

Upon many questions that might arise between the State as owner of the bed of a little lake and the shore owners, it would be presumptuous to express an opinion now, and fortunately the occasion does not require it.

QUASI-JUDICIAL CAPACITY OF SURVEYORS

I have thus indicated a few of the questions with which surveyors may now and then have occasion to deal, and to which they should bring good sense and sound judgment. Surveyors are not and cannot be judicial officers, but in a great many cases they act in a quasi-judicial capacity with the acquiescence of parties concerned; and it is important for them to know by what rules they are to be guided in the discharge of their judicial functions. What I have said cannot contribute much to their enlightenment, but I trust will not be wholly without value.

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Three-Wire Leveling

By PHILIP KISSAM

PRINCETON UNIVERSITY

A SYSTEM of accurate benchmarks is a fundamental necessity for every project. Every State, county, city, and town should have such a system and certainly no job should be started without an established system of permanent benchmarks with elevations that are known to be reliable. It follows that the determination of benchmark elevations is an important part of every surveyor's business.

Many engineers know how to run differential levels accurately and rapidly but, to the everlasting disgrace of the profession, innumerable man-hours are wasted every year in this country by methods of benchmark leveling that are blundering, slow, inaccurate, and inadequate for the purpose.

Probably the chief culprit to be blamed for this state of affairs is the target. It is not pleasant to contemplate how many dollars the target has cost this country. The target seems to have an uncanny fascination for our surveyors. As soon as plans are made for benchmark leveling, they apparently gird themselves for the task of making precise measurements by a decision to use the target for every sight. "The target has a vernier. It can be read to thousandths of a foot. There's your precision." And so the levelman in the field begins his laborious routine. "Up a hair, down a hair, up a hair." The rodman plumbs the rod, moves the target, and so on. He is never able to get the target just where it is wanted. The process becomes a test of patience. When the levelman's patience is exhausted, he calls "all right." It has ceased to matter to him whether or not the bubble is centered. He is thankful enough to get the target practically on the crosshair.

When it is realized that the levelman can read the rod in the first place more accurately than he could set the target, even if he could control it himself, the absurdity of the whole process becomes evident. Tracy demonstrated thirty or forty years ago that a target reading is not as accurate as a direct reading. And yet hundreds of miles of benchmark leveling are run each year by just this method.

Let us assume that the rodman (who is usually the most inexperienced member of the party) never makes a mistake in reading the target position and that the levelman is so careful and patient that his work always checks out. Under these delightfully halcyon conditions no time is ever wasted for re-runs. Even then, this procedure provides the slowest and most expensive known method of running benchmark levels.

There are many better methods of running levels (no method can be worse), and many of these better methods are used extensively, but the curious fact remains that the best method of all is almost never utilized. This method is old, almost hoary with age. It is very fast, it gives the greatest accuracy, it automatically prevents blunders, it is based on scientific principles, and it is the fundamental method used by our greatest surveying agencies—the U. S. Geological Survey and the U. S. Coast and Geodetic Survey. Why isn't it used in private practice?

The method, of course, is the three-wire method. To use it, the level must have stadia wires. The levelman reads the rod at the three wires and takes the average. For the best results he should center the bubble for each reading. It is as simple as that.

Perhaps it is seldom used because many levels have only one horizontal wire. But the maker of any instrument will install a three-wire reticle at a nominal cost. As a matter of fact, the three-wire method will save the cost of an entirely new instrument in a short time. Perhaps it isn't used because all of us, at some time or other, have read a stadia wire instead of the center wire

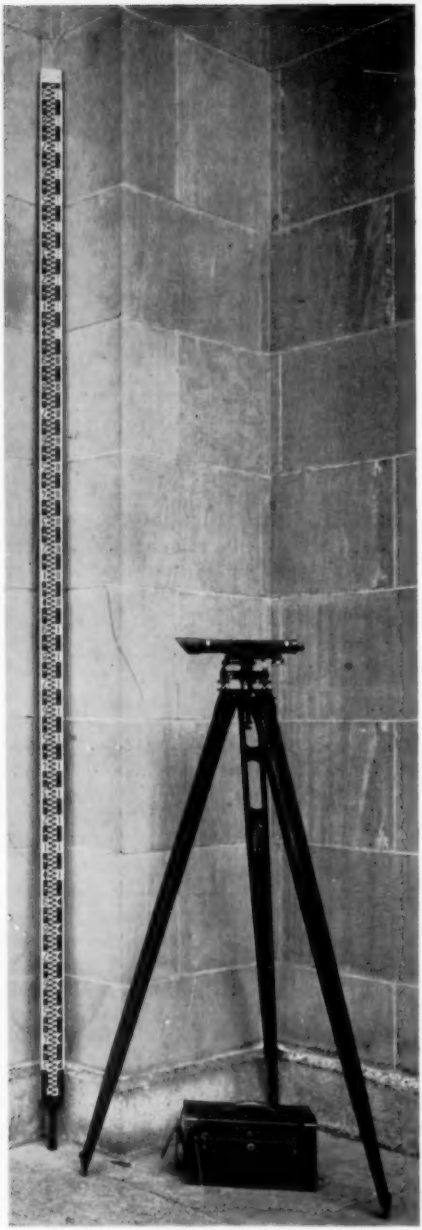


FIGURE 1.—Standard yard rod used by U. S. Geological Survey. Numbers are inverted to read upright with the non-erecting prism level.

and we are afraid to use an instrument with stadia wires for routine leveling. But today we have glass reticles with stub stadia lines that cannot be confused with the central wire. It might be because some of us have tried the three-wire method with stadia wires set for a 1 to 100 stadia ratio and found that the accuracy was little better than when one wire is read. This is quite true, of course. The stadia stubs should be set near the central horizontal wire so that they are seen within the best part of the optical system, and so that greater differences in elevation are possible between the instrument and the rod. A stadia ratio of 0.3 per 100 is excellent.

Any rod can be used for the three-wire method, but the most satisfactory rod is one graduated in hundredths of yards (fig. 1). The thousandths of a yard can be estimated. With such a rod the sum of the three-wire readings gives the rod reading in feet. If a stadia ratio of 0.3 per 100 is used, the stadia intercept multiplied by 1,000 gives the length of the sight in feet. With this ratio, the intercept is 0.300 of a yard at 100 yards. Multiplying the intercept by 1,000 gives 300 which is the length of the sight in feet. Rods with invar ribbons graduated in hundredths of a yard are on the market today. Below is an example of a reading on a yard rod as illustrated in figure 2.

	Reading	*Intercept*
Upper wire	1.452	
		0.077 upper
Middle wire	1.529	
		0.078 lower
Lower wire	1.607	
Sum	4.588	0.155

The rod shot is 4.588 feet and the length of sight is 155 feet. This is a pretty simple system.

The Geological Survey uses a variation of this system that affords a convenient check on the distance reading. The level has three wires spaced so that the interval between either the middle and the upper wires or the middle and the lower wires, multiplied by 1,000, gives the distance in feet. This permits two independent determinations of the length of sight. Thus, if the Ge-

ological Survey instrument were used and the readings were as illustrated in figure 2 and tabulated above, the rod shot would be 4.588 feet (as above) and the distance would be 77 feet (instead of 155 feet).

The advantages of this method compared to other types of leveling can be listed as follows:

1. The rod is read at the moment the bubble is centered. The levelman can keep the bubble centered and make the three readings faster than he can direct one setting of the target.
2. Since the bubble is centered, the rod readings are more accurate than when the levelman's attention is distracted from the bubble by directing the setting of the target.
3. Since, as all of us know, it is difficult to read an ordinary rod better than to the nearest 0.003 feet, no precision is sacrificed by reading to the thousandths of a yard.
4. With divisions on the rod that are three times as large as usual, it is much easier and quicker to read the proper division, especially when heat waves are present.
5. Since it is always more accurate to read the rod than to direct the setting of a target, accuracy is improved for this reason alone.
6. With practically no extra expenditure of time, the result of one level run is nearly as accurate as the average of three single-wire level runs.
7. If the upper intercept equals or nearly equals the lower intercept, no blunder in reading can have occurred.
8. The length of the foresight can be checked against the length of the backsight.
9. If desirable, the total unbalance between the sum of the lengths of the foresights and the sum of the lengths of the backsights can be computed and a correction can then be applied to the elevation difference in accordance with the instrumental error.
10. The total length of the level line can be computed so that it can be properly weighted in the adjustment of a level net.

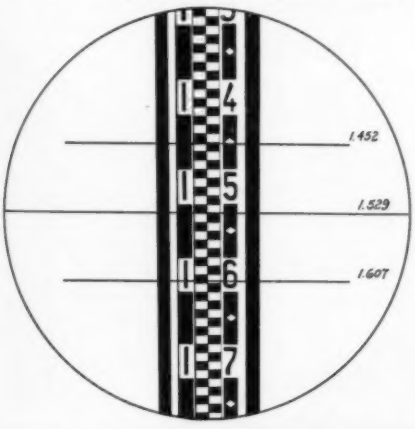


FIGURE 2.—Portion of yard rod as observed through an inverting instrument with three wires.

There are so many advantages in the method that it is difficult for the writer to understand why the method is not used for all work where accuracy is important and costs must be reduced.

Not long ago the writer was asked to review the precise leveling work of the public works department of a large, heavily populated county. The project in hand was to establish a dense net of benchmarks connected by better than second-order leveling. The required closure, stated in feet, was $0.029\sqrt{M}$ where M was the length of the section in miles.

The method of leveling consisted of taking a backsight and a foresight and then a foresight and a backsight from one instrument position, then moving the level a foot or two to one side and repeating the process in reverse order. The length of the sights were kept at about 100 feet.

One wire was used and the target was set to determine each rod reading. If the results of the two level positions did not check within $0.0004\sqrt{D}$ where D was the distance in feet between turning points, the operation was repeated. Note $0.0004\sqrt{D}$ is the same as $0.029\sqrt{M}$. One mile a day was considered good progress.

The complaints were that many reruns were necessary and that the levelmen were complaining of headaches, lack of sleep, loss of appetite, and inability to relax. In other words, they were showing all the signs of approaching nervous prostration.

It didn't take much leveling experience to realize what was causing both the difficulties. It was our old friend, Mr. Target. The poor levelman had to set the target

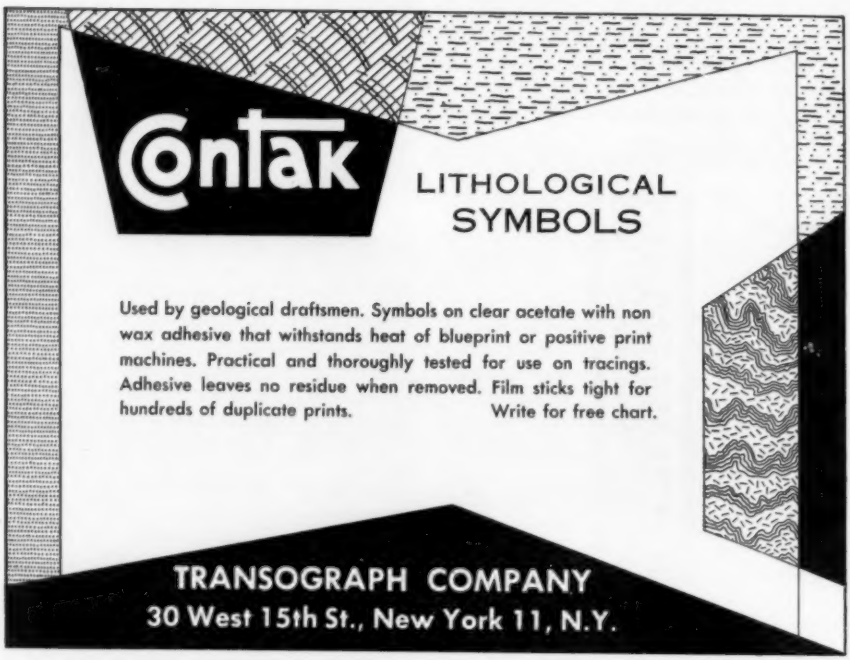
eight times almost without a break and sometimes sixteen times before he could change his position. No wonder he was turning into a nervous wreck. Needless to say, under those conditions he didn't center the bubble as perfectly as he might have and, needless to say, he was exhausted by his work.

We threw away the target, had three-wire reticles installed, eliminated the second setup, and substituted two separate runs instead.

Most of the leveling is now closing with first-order accuracy and the work is running four times as fast.

While the final method adopted is not the most ideal procedure, it was a good compromise. It produced the results desired and pleased everyone. Actually they are getting the average of 12 rod readings where they were getting 8 before. It seems to the writer to be an excellent example of what three-wire leveling will do.

The costs of surveying, like all operations that cannot be mechanized, are rising faster than any other costs today. It would seem evident that we can no longer afford the luxury of continuing old procedures just because they are traditional and that now is the time to give serious thought to instruments and methods that promise higher accuracies at lower costs.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Alidade Development in the Geological Survey

By C. S. MALTBY
GEOLOGICAL SURVEY

THE Geological Survey has recently tested a pilot-model planetable alidade incorporating several basic improvements. The new design uses a pendulum leveling device instead of the conventional bubble; it has optical reading of an enclosed glass circle; and it has a new arrangement for adjusting the inclination of the telescope that permits continuous, unlimited slow motion. If field tests this year are as successful as the shop tests, the improved design will be an important step forward in the development of the alidade.

In spite of the expansion of photogrammetric methods in recent years, field work with the planetable and alidade is still important in topographic mapping. Formerly, of course, the planetable was the topographer's principal instrument. During the past 75 years the pioneer topographic maps of the United States—especially those of the western plains and mountains—were field sketched by Geological Survey topographers with planetable and alidade.

Now, plotting from aerial photographs has largely supplanted planetable sketching, but the planetable continues in active service. It is used to contour areas too flat to map from photographs. It is indispensable for field completion and revision of photogrammetric compilations. It is a simple and versatile method of establishing supplemental control elevations. There is no prospect that the planetable will be obsolete in topographic mapping in the near future. More alidades are in use today than ever before, and there is a continuing active interest in improved design.

Presented at the Fourteenth Annual Meeting, American Congress on Surveying and Mapping, Washington, D. C., March 22–24, 1954.

AN EARLY TYPE OF ALIDADE

The alidade is rather broadly defined by Webster as "that part of any optical, surveying, or measuring instrument which comprises the indicator, verniers, microscopes, etc." It is essentially a simple instrument as used with a planetable. It is a straightedge, or ruler, with a device for controlling a sight line. The sight line may be

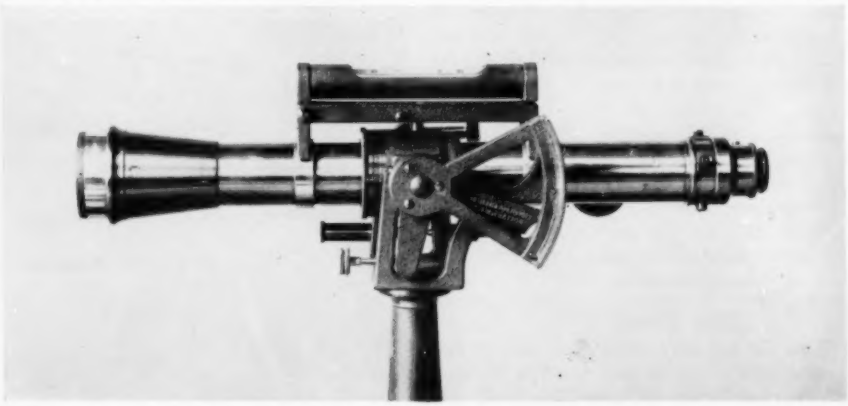

FIGURE 1.—Old-type Geological Survey alidade.

varied in a vertical plane parallel to the straightedge, and the amount of variation—the vertical angle—may be measured.

Primitive peepsight alidades, sometimes used today, were actually made from a wooden scale by attaching simple open sights at the ends. In some models one of the open sights was in the form of a slot with a scale for reading vertical angles. Later, a telescope replaced the open sights, the striding level and vertical circle were added, and the alidade became an engineer's rather than a reconnaissance instrument, although the first models would probably not be considered very precise by today's standards. Over the years, a number of refinements and improvements have been incorporated, with the object of increasing the accuracy of the instrument, making it more reliable, or making it more convenient to carry and use.

The alidade used by the Survey about 50 years ago, illustrated in figure 1, was designed for easy field adjustment, an important consideration in those days for work in the back country where repair facilities were not available. With the telescope leveled, the striding level could be checked quickly by reversing it, end-for-end, and it could be adjusted by means of a screw until it read the same in both positions. The collimation of the telescope—coincidence of the line-of-sight with the axis of the telescope—could be checked by sighting on a distant point and rotating the barrel of the telescope 180 degrees in the mount. If the point did not stay centered, the crosshairs could be shifted by capstan screws to correct the misalinement. The vertical circle was graduated in degrees, with a vernier giving readings to one minute. Although the instrument has a rather antique appearance today, it was reasonably accurate, simple in construction, and dependable. It was rugged enough to withstand hard service for many years, with but little maintenance.

THE BEAMAN ARC

One of the early and most useful improvements to the alidade was the Beaman arc, named for the inventor, Major W. M. Beaman, a Geological Survey topographer around the turn of the century. (Figure 1 shows a drum-type version, used then.) The Beaman arc measures vertical angles in steps instead of degrees, simplifying the computation of elevation differences when used with stadia distances. The steps are graduated in sequence above and below the level line, and they vary in magnitude from 34.38 minutes for level sights to 69.77 minutes for sights 30 degrees above or below the horizontal. When the index is set exactly on a Beaman arc division, the elevation difference along the line-of-sight is obtained by multiplying the stadia intercept on a vertical rod by the number of steps above or below the horizontal, a simple and easy field computation. The size of the steps compensates for the distance discrepancies caused by the inclination of the line-of-sight, and by the fact that the stadia rod is not at right angles to the line-of-sight. The Beaman arc includes a scale expressed in percent for converting stadia distances on inclined sights to corresponding true horizontal distances.

Although it has been modified considerably in details, the Beaman arc is still used today, both on alidades and on many engineers' transits. On alidades an auxiliary bubble has been added to level the arc assembly without leveling the telescope. (*See* fig. 2.) At the same time that the separate bubble was added, the arc was changed from the drum type to the conventional flat form,

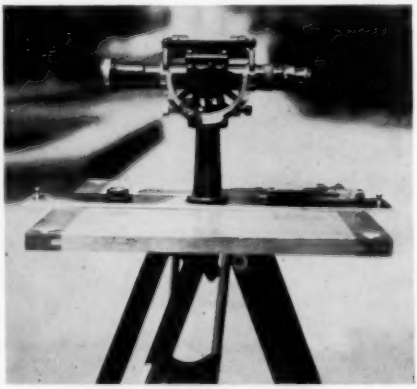

FIGURE 2.—Standard alidade.

although the scales remained the same. Later, a small magnifying glass was attached for quicker and more accurate reading. The last modification provided a separate bearing for the arc, independent of the telescope, to eliminate motion of the arc when the telescope was raised or lowered in sighting.

THE RETICLE

The design and construction of the alidade reticle also has undergone considerable modification through the years as a result of Survey experience. In early instruments, the crosshairs may have been human hairs. Later, spider web was substituted for hair, being finer than hair and fairly durable in short lengths. Early topographers frequently replaced broken crosshairs with spider web gathered in the field. However, spider web is affected by moisture and during periods of high humidity

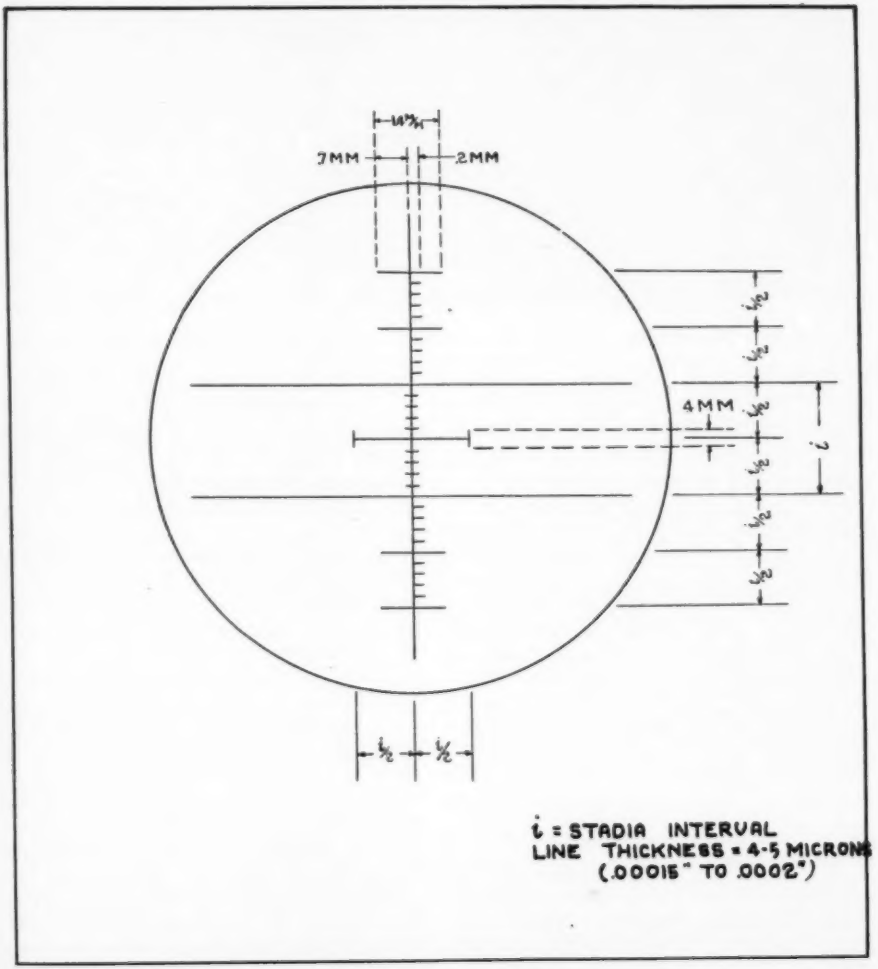

FIGURE 3.—The glass reticle.

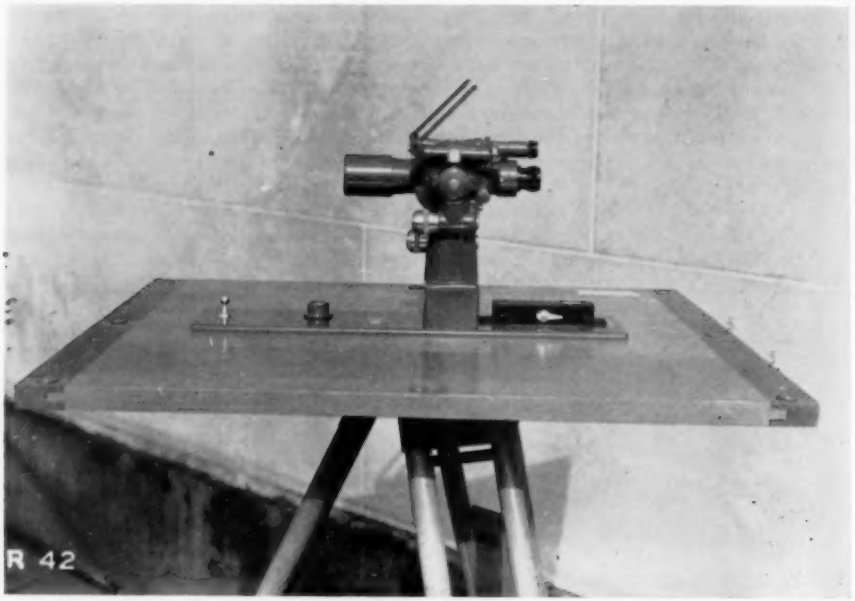

FIGURE 4.—Optical-reading alidade. This instrument was modified from original design to meet Geological Survey requirements.

the crosshairs tend to droop. Very finely drawn platinum wires replaced spider web many years ago. The latest development, now standard in almost all instruments, is the use of fine lines etched on glass. They can be made as fine as desired, they are permanent, and they allow a variety of designs to be used.

The standard alidade glass reticle now in use has 3 stadia intervals, 1½ above and 1½ below the center hair. (*See* fig. 3.) The short center hair also is a stadia interval in length between the vertical bars, for use with rods held horizontally. To provide more flexible reading procedures, the vertical stadia intervals are subdivided into tenths.

OPTICAL-READING ALIDADE

With the exception of the improvements just mentioned and small improvements in the trough (box) compass, alidades in the United States remained fundamentally the same until the British firm, Hilger and Watts, introduced their optical-reading instrument in 1950. Their alidade was described and exhibited by Mr. Stanley, a director of the firm, at the Eleventh Annual Meeting of the Congress, June 18–20, 1951.

This alidade (*see* fig. 4) differs drastically in appearance, and somewhat in use, from previous models. It has an enclosed glass circle with the standard Beaman scales and an angle scale graduated in 10-minute intervals. Readings to the nearest minute are obtained by estimation; it has no vernier. Separate bubbles, with mirrors for behind-the-instrument viewing, are provided to control the vertical circle and the telescope. However, the bubbles are fixed to the instrument and cannot be reversed to check parallelism with the line-of-sight; a peg test is required. The telescope can be plunged—that is, swung around in a vertical plane to sight in the opposite direction—but it cannot be rotated about the line-of-sight to check collimation, and there is

no external means of moving the reticle, so a field adjustment of collimation is not as easily made.

Experience with more than 50 optical-reading alidades under various field conditions leads to the conclusion that the accuracy obtainable is equal to or better than older types, and the speed of operation is definitely greater. The streamlined construction, the enclosed parts, including the tangent screws, make it easy to handle and maintain in the field; and the 20-power magnification of the reading microscope makes accurate estimation of vertical angles relatively simple in spite of the lack of a vernier.

THE PENDULUM IDEA

The success of the optical-reading alidade, with its enclosed glass circle, and the advantages of pendulum leveling over the traditional bubble as demonstrated in the Zeiss-Opton level, led to several proposals for a new alidade that would include both. In 1951, Rolland L. Hardy, then employed by the Geological Survey, independently submitted as a suggestion a practical design for a pendulum-operated Beaman arc. His ideas, considerably modified, formed the basis for a pilot model. In principle, the design is very simple. The vertical circle, enclosed in a metal casing, is free to rotate about a horizontal axis coincident with the axis of the telescope. A 4-ounce weighted pendulum keeps the circle plumbed, replacing the bubble-and-arc setting required with conventional instruments. The index mark, superimposed by a microscope on the image of the circle, moves with the telescope, so that any angle of inclination may be read, within the 60-degree range of the telescope motion. In effect, it is equivalent to a plumb-bob with a protractor arranged to measure the vertical angle of the line-of-sight.

Elementary as this is in principle, those who have been concerned with instrument development will appreciate that the problems of producing a model in a practical form are not easy to solve. Development of the prototype led to the realization that it was desirable to apply the pendulum principle as a modification of the present alidade rather than design a completely new instrument, although this imposed some limitations on the size and shape of parts. The modifications, if successful, then could be applied to any of the several hundred alidades on hand. Also, using an existing instrument as a base meant that fewer new parts would be required, and some desirable features could be retained—particularly the rotatable telescope for checking collimation and the reversible striding level. It was thought that a bubble would be necessary, or useful at least, as a check on the operation of the pendulum.

THE PILOT MODEL

The principal problems in the design of the pendulum and circle assembly (*see* figs. 5 and 6) were to devise means of reducing friction at the bearing to the smallest possible amount so the circle would come to rest at the plumb point, and at the same time to provide a damping medium to diminish oscillation or swing which would cause delays in reading. During a period of about 2 years, experiments were made with different combinations of metals, bearings, and damping devices. The design adopted used a nonmagnetic tungsten alloy for the 4-ounce pendulum weight, ball bearings to mount the assembly on the shaft, and a fluid-filled casing to act as a damper. The fluid selected is a silicone compound, transparent to permit reading the circle through it, and having a relatively uniform viscosity over a wide temperature range. The bearings are the most critical parts; their friction drag is about 0.001 inch-ounce.

The fluid fills the chamber completely, except for a float and a small metal bellows vented through a needle hole to accommodate pressure changes caused by variations in temperature and atmospheric pressure. The float is provided to reduce the amount of fluid required, thereby bringing the size of the bellows within practical limits. Work on the prototype soon indicated the necessity for an absolutely dust-free environment for assembly. A pressurized cabinet with an electrostatically filtered air supply was acquired for this purpose.

Shop tests of the final pilot model gave very encouraging results. More than a hundred readings of the circle index under a high-powered microscope showed that the accuracy to be expected was within 10 seconds of arc—considerably more accurate than the standard alidade bubble. The pendulum came to rest with a minimum amount of oscillation in a time of less than 5 seconds.

SHOP PRODUCTION

After limited field tests showed equally good results, the design was approved for Instrument Shop production of 4 models for extended field tests. Even a small production order of 4 instruments involves problems considerably different than those encountered in producing an experimental model. Jigs and other shop tools are necessary to insure uniformity. Sources of

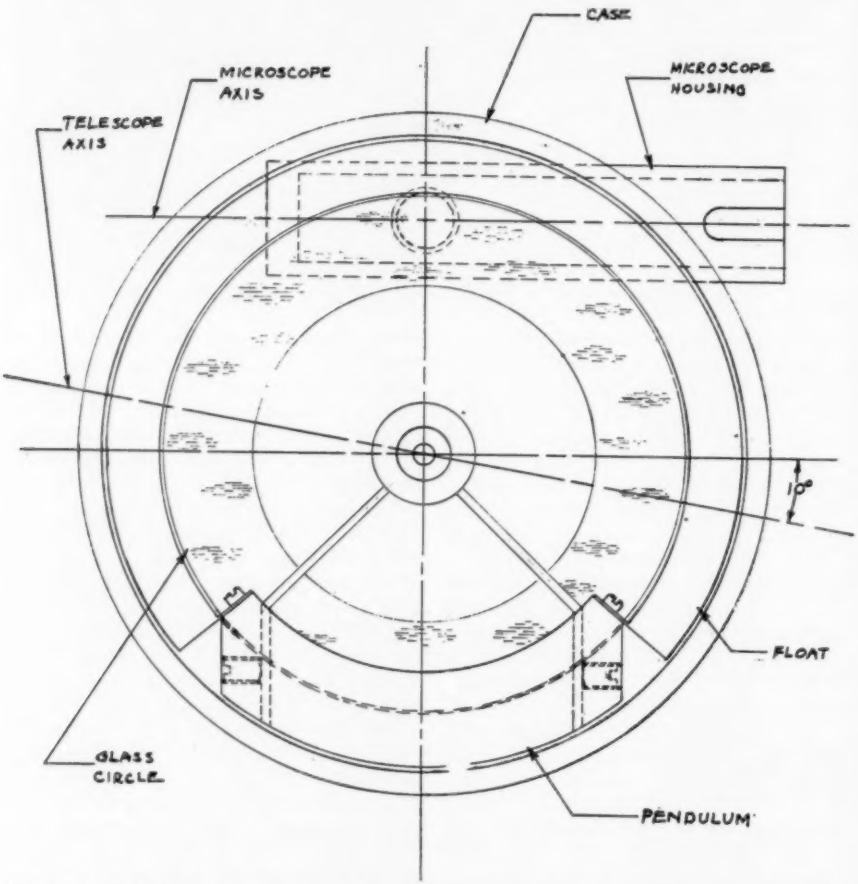

FIGURE 5.—Left-side view of the pendulum with cover removed. This view shows the pendulum, lower center, with bent supporting wires. Attached to the pendulum, and completely immersed in an oil-like liquid, is the pendulum float. The glass circle, attached to the pendulum and turned by it, is represented by the partially hatched area inside the float.

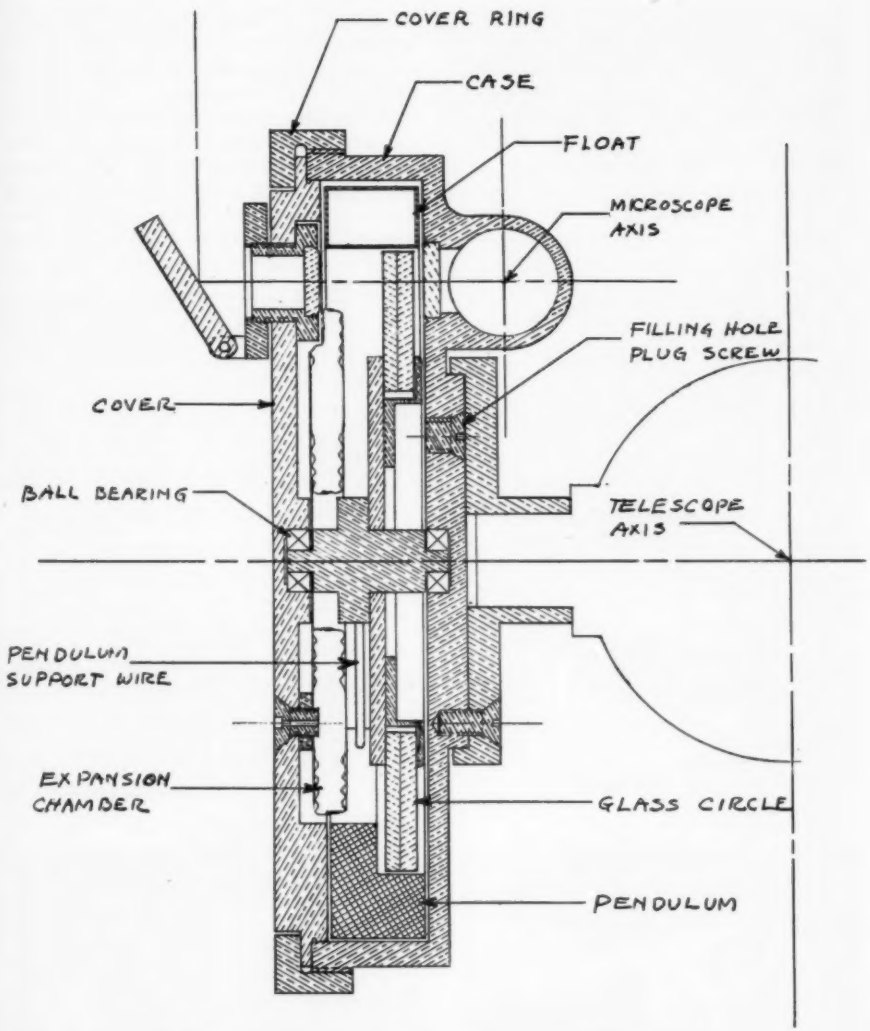

FIGURE 6.—Cross-section view of the pendulum assembly. In this view, note the doughnut-shaped expansion bellows, vented; the ball bearings for the pendulum; and the illumination of the glass circle.

supply for materials and special parts must be found, and the design must be modified to permit easier manufacture, to provide necessary adjustments, and to remedy minor defects. After several months were spent in these activities, a shop model has been assembled, as illustrated in figures 7 and 8. The component parts of the pendulum are illustrated in figure 9.

During this time it was decided to incorporate another improvement that had been suggested from time to time, not related to the pendulum arc assembly. This is a new type of tangent screw for the slow-motion control of the telescope inclination, a device used on every sighting to set the crosshairs exactly on the mark. The older type of tangent screw, unchanged for a great many years, had several drawbacks. The threads were exposed and frequently became clogged with dust and dirt even when carefully cleaned and oiled. The screw must be

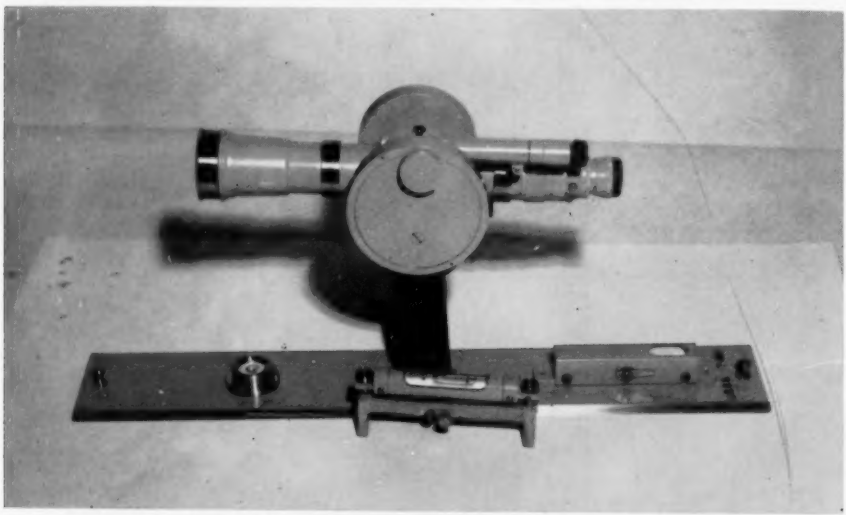

FIGURE 7.—The pendulum alidade.

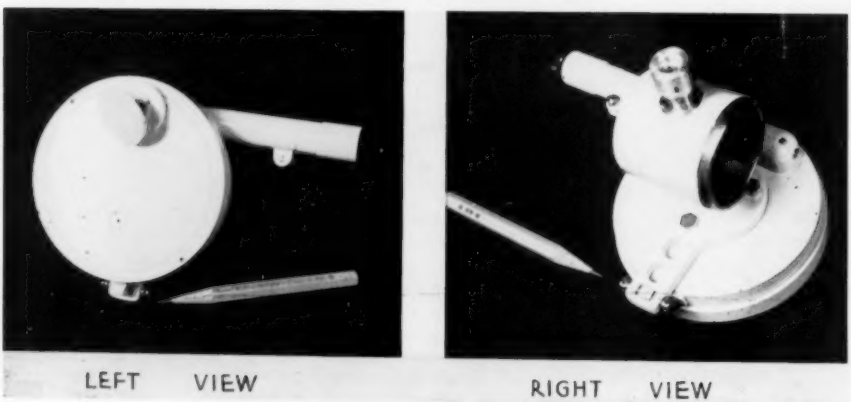

FIGURE 8.—Completed pendulum assembly.

turned against, rather than away from, a spring-loaded plunger on the final setting, leaving an opportunity for error. But most annoying, the screw has a limited motion which frequently runs out just when a setting is about to be completed, necessitating a delay while the screw is brought back to the center and the telescope reset on the mark by releasing the clamp. Everyone who has used any instrument with a tangent screw understands this difficulty.

The new tangent screw, designed to overcome these disadvantages, is an enclosed worm-gear assembly, packed in grease, and attached to the telescope with a friction clutch. The telescope can be moved to an approximate setting against the clutch without loosening a clamp screw, as required in the older type. The casing is sealed and dust free, and the tangent screw, since it is a worm-and-gear device, has a continuous travel and never requires reversing or resetting. As it does not act against a spring, the direction of motion does not affect the accuracy of setting. The tangent screw assembly, shown in figures 10 and 11, looks somewhat like an auxiliary vertical circle. It adds about 6 ounces to the weight of the instrument, but its advantages are thought to be worth the additional weight.

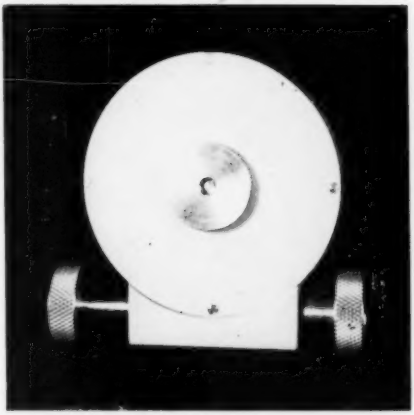

FIGURE 10.—Tangent screw assembly.

PENDULUM ALIDADE TESTS

Testing of the shop model, carried out in

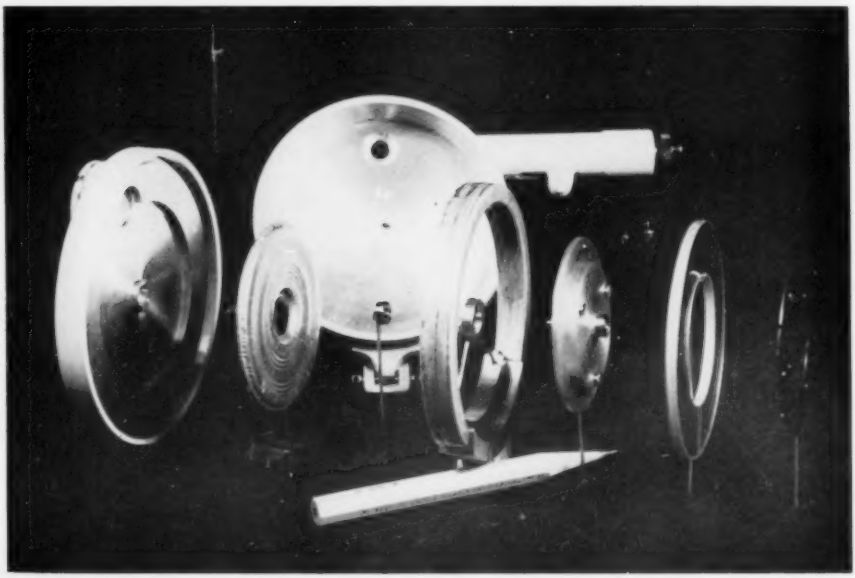

FIGURE 9.—Pendulum parts.

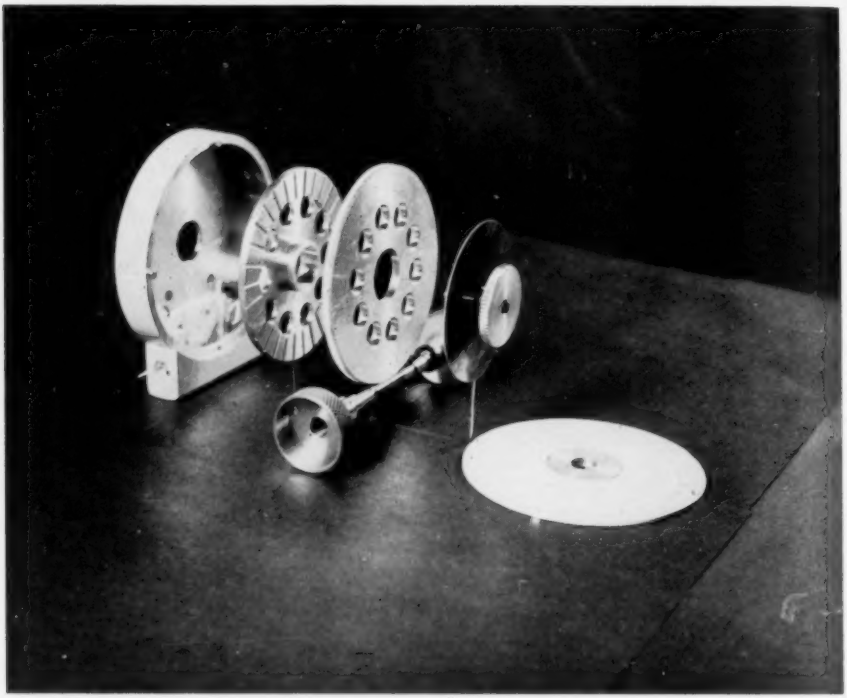

FIGURE 11.—Tangent screw parts.

Washington over the past three or four months, has included all the various field operations on which an alidade is used in regular mapping work, in addition to bench tests in the instrument shop. Several miles of road traverse were run over a controlled course. Peg tests were carried out, and fairly extensive vertical-angle measurements were made on a number of objects to compare the results obtained with the new model to the readings to the same points with the T–2 theodolite and standard alidades. During these tests the speed of operation as well as the accuracy of the results was considered.

In the traverse along a 1.1-mile course having an overall elevation difference of 225 feet, the alidade elevations at turning points agreed in all cases within 0.2 foot with the elevations at the same points determined by spirit level. Line closures between benchmarks at the ends of the course on three runs were 0.1, 0.4, and 0.6 foot, with the differences probably attributable in part to inaccurate stadia distances on the steeper slopes, some of which required a Beaman arc setting as high as 10. For the usual stadia traverse in supplemental control surveys or in field sketching, this accuracy is entirely satisfactory.

A peg test using an 880-foot course showed an instrument correction factor of approximately 0.1 foot per thousand feet, which is the same order of accuracy indicated by the traverse tests.

For a vertical-angle test, readings were made to 12 objects with a T–2 theodolite, with the vertical angles recorded to tenths of seconds. Alidade vertical-angle readings, like those on the common engineer's one-minute transit, are read to the nearest minute. The nearest-minute readings of

the alidade test are compared with the T–2 readings in figure 12.

A summary of the results shows the average apparent reading error for a standard-type alidade to be about 1.1 minutes per pointing, and in the best series of readings, about 0.7 minute. With the pendulum alidade, the average is less than 0.5 minute, and in the best series, about 0.3 minute. The average time required for each reading with the standard-type alidade was 54 seconds; with the pendulum alidade, 27 seconds.

These test readings were limited in number, and were made under good conditions. They should not be considered as authoritative, but do indicate great promise for good field results.

From the data recorded during these tests, the time required to complete a reading with the pendulum alidade was compared with that required to make the same reading with two other standard-type alidades. In general, the time required for the pendulum alidade was about half that for the other two. With the pendulum alidade, an average time of about 20 seconds was needed for stadia and elevation readings compared with over 50 seconds with the other instruments. During a day of field

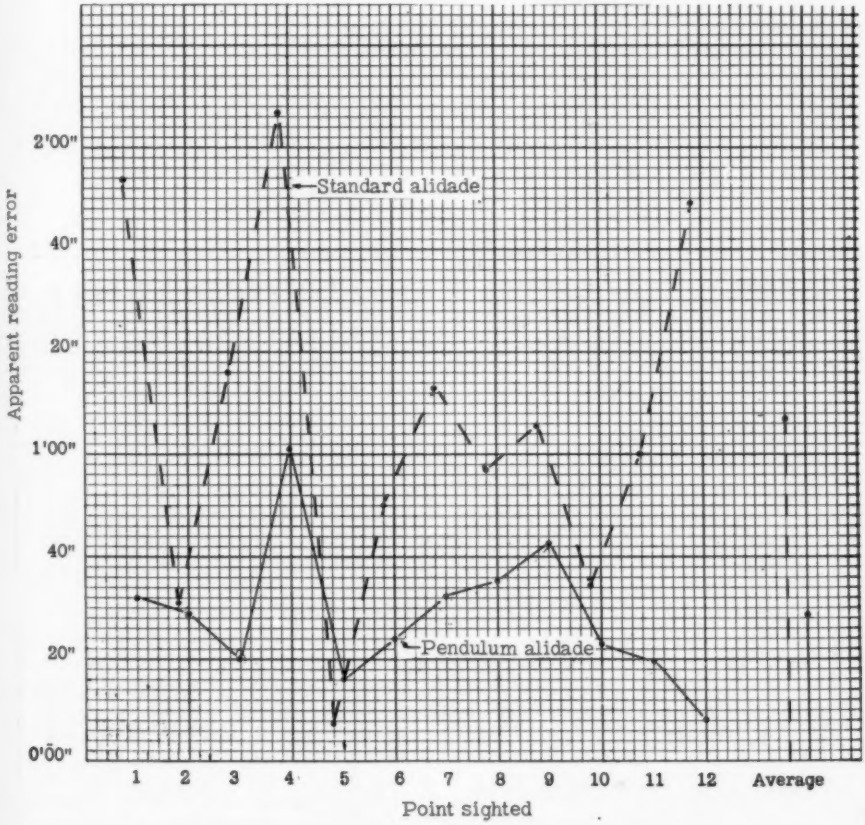

FIGURE 12.—Comparison of vertical-angle readings. Dots represent differences in minutes and seconds of the averaged alidade readings as compared to the T–2 readings for the same 12 points.

work with 100 setups, or 200 readings, the time saved would amount to more than an hour. The speedier operation is due in part to the pendulum, in part to the optical reading system, and also to the more convenient tangent screw arrangement.

APPARENT ADVANTAGES

The advantages expected from the use of the pendulum principle are not entirely those of speed and convenience of operation, however. It also has some inherent advantages over a bubble, not completely proven at this time, but strongly suggested. A bubble, particularly a sensitive and accurate bubble, is fragile and must be handled very carefully and guarded against shocks and vibration. It is hoped that the pendulum will prove to be more rugged and reliable. Also, a bubble, as is well known, is subject to inaccuracies due to temperature changes, especially when it is exposed to direct sunlight. The pendulum, it seems fairly certain, will not be affected in this way.

The four shop models will be given extensive field use tests this coming summer, on regular field mapping work. When the results of these tests are available, it will be possible to evaluate the experimental work described here with more assurance.

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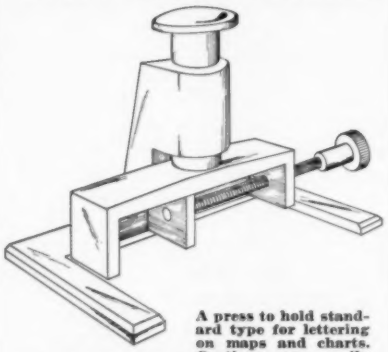
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The Zeiss Opton Ni-2 Automatic Level

By C. L. PECKINPAUGH, JR.

PHOTOGRAMMETRY, INC., SILVER SPRING, MD.

DOWN through the ages the plumb line, the free surface of a pool of liquid, and a bubble in a confined liquid have indicated the direction of gravity for astronomer, geographer, and surveyor.

The limitations of each method have determined the extent of its use and, judged in this manner, it is obvious that the limitations of the bubble in a confined liquid, or the spirit level, have been the easiest to eliminate or accommodate. However, anyone who has used a spirit level knows that all of its limitations have not been overcome, and experience shows that to a great extent a leveling instrument is good or bad depending on the designer's awareness of these limitations and his success in allowing for them. And, finally, this awareness must be shared by the instrument user to insure a successful survey.

These opening remarks are not meant to convey that the problem of designing a good leveling instrument has received too little attention. The contrary is probably nearer the truth. It is likely that these very facts are the cause for the complete break with tradition which the Zeiss Opton level certainly is. Indeed it is with difficulty that some, long associated with levels and astrolabes, are made to understand that nothing in the Zeiss level remains level or plumb.

The Ni-2 level was introduced in this country in June of 1951 at the Eleventh Annual Meeting of the American Congress on Surveying and Mapping in Washington, D. C. The Zeiss Company exhibited two instruments and sold both from the exhibit floor, one to the U. S. Coast and Geodetic Survey, and the other to the U. S. Geological Survey. The Geological Survey took immediate steps to test the instrument, first in the field, then in the Instrument Design Section where it was dismantled for study. The reports resulting from the tests and the study, as well as an article by Dr. M. Drodofsky,[1] the inventor of the automatic feature, have been used in preparing this paper.

Presented at the first annual fall conference of the Land Surveyor's Division of the New Jersey Society of Professional Engineers, November 7, 1953, Princeton University, Princeton, N. J.

THE PROBLEM

To begin the description of the Ni-2 level let us first state the problem of automatic compensation with the help of a few diagrams. Figure 1a illustrates a truly horizontal telescope with rays of parallel light

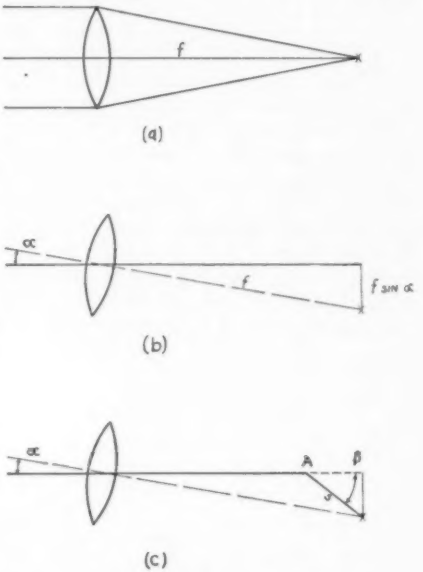

FIGURE 1.—Automatic compensation of telescope tilt.

[1] DRODOFSKY, M., Neue Nivellierinstrumente: Zeitschrift für Vermessungswesen, Vol. 8, pp. 225–231, 1951. (English translation available from Keuffel & Esser Co., Hoboken, N. J.)

from a distant target imaged at the center cross of the reticle. Figure 1b shows the telescope tilted upward an angle α with the distant target now imaged a distance $f \sin \alpha$ above the center cross. The problem is to shift the image back to the center. Figure 1c shows schematically how this is done. A mirror placed at A, a distance s from the reticle, turns the rays though angle β to fall at the center. The conditions which must be satisfied are: to control the rotation of the mirror about A in such a manner that $s \sin \beta = f \sin \alpha$; and to make the telescope truly anallactic, and to consider the tilt axis to be coincident with the anallactic point. The second condition results from variations in the value of f with changes in focus.

Figure 2 shows a diagram of the Ni-2 optical system. Elements *1* and *2* are the telescope objective, *3* is the focusing lens, *4* and *6* are mirrors fixed to the telescope, *5* is the compensating mirror, *7* is the reticle, and *8* the two lenses of the eyepiece. *AC* and *BD* are wires attached to the telescope at *A* and *B* and to the compensating mirror at *C* and *D*, the weight of the compensating mirror acting as a pendulum supported by the wires. From the relation $s \sin \beta = f \sin \alpha$ it will be seen that the compensating mirror must tilt through an angle greater than the tilt angle of the telescope. In the Ni-2 level this ratio is about 2 : 1.

Part of the angular magnification required is obtained through the difference in the lengths of *AB* and *CD*, figure 3, the remaining magnification being obtained by a shifting of the center of gravity, *S*.

THE SOLUTION

The swinging system *CDS*, figure 3, is in balance when the vector of gravity originating in the center of gravity, *S*, passes through the point of intersection, *P*, of the extension of lines *AC* and *BD*. With a disturbance of *CDS* (*AB* remaining fixed) it will be seen that both *S* and *P* move in the same direction, with *P* moving a greater distance than *S*, the difference being r. With the disturbing force removed the system will swing back until the vertical force vector through *S* again passes through *P*.

Now consider the telescope, *AB*, tilted, with *AC* being momentarily fixed, figure 4. In this case *S* will move the greater distance and, when *AC* is released, *CDS* will continue to swing until point *P* has caught up with *S*, thus adding to the tilt magnification caused by the shorter length of *CD*. If the center of gravity is moved upward (*S* above *CD*), *P* will travel farther giving greater magnification, with less magnification resulting from a lowering of the center of gravity. Referring back to figure 3 it will be seen that there is a limit to such magnification control, for, as *S* is raised, r becomes smaller until, with $r = 0$, neutral equilibrium is reached and, with continued raising, the pendulum will topple over.

To be sensitive to the few seconds of arc required for precise leveling it is necessary

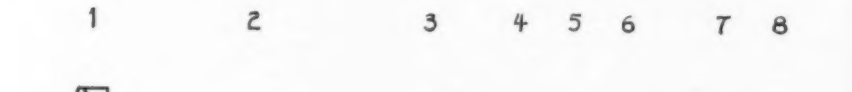

FIGURE 2.—Schematic diagram of Ni-2 optical system.

that the pendulum swing with practically no friction. The makers claim that the bending wire makes a hinge with no appreciable friction and experience appears to prove their claim. Such low friction makes it necessary to provide damping for the pendulum, an air dash-pot being used in the Ni-2 level.

DO NOT TAMPER

While the following illustrations reveal a comparatively simple instrument, it is well to point out that the removal of the eyepiece ring cap for collimation adjustment and re-

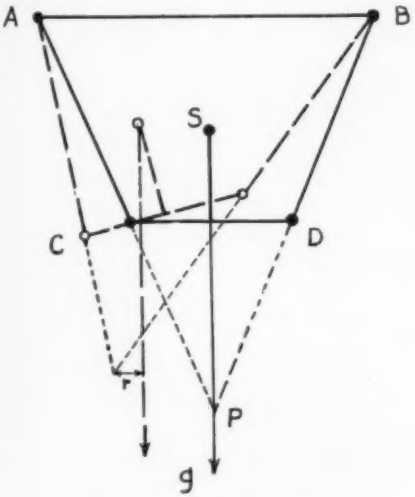

FIGURE 3.—Swinging system.

moval of the circular level adjusting screw cap is the only dismantling that can be done without removing the telescope from the upper plate. And this cannot be done without removing the proper screws and parts from the lower plate. It is not intended that this paper enable the reader to take the instrument apart but rather to so satisfy his curiosity that he will not want to. I know of no case in the Tennessee Valley Authority or the U. S. Geological Survey (the field of my experience) where a field man tried to finish the day's work by making a repair inside an optical reading instrument, but what the only thing finished was the instrument. The operators of today's fast, precise, optical-reading surveying instruments should not be expected nor allowed to repair them any more than such permission is granted the operator of a modern precision automatic machine tool.

A three-quarter view of the level mounted on its tripod is shown in figure 5. Figure 6 shows the telescope removed from the upper plate with the eyepiece and objective end caps removed. The compensator is nested between and supported by two heavy projections from the main telescope body casting and the reticle assembly is fastened to the ends of the projections. The end cap standing at the right both supports the eyepiece and protects the compensator and reticle.

THE COMPENSATOR

In figure 7 the compensator is shown removed from the telescope and resting on the base of the pendulum. In this position the weight of the compensator body and prism assembly is being borne by the damp-

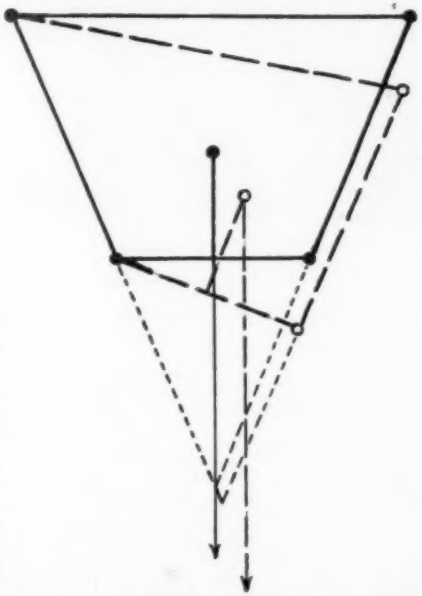

FIGURE 4.—Swinging system with tilted telescope.

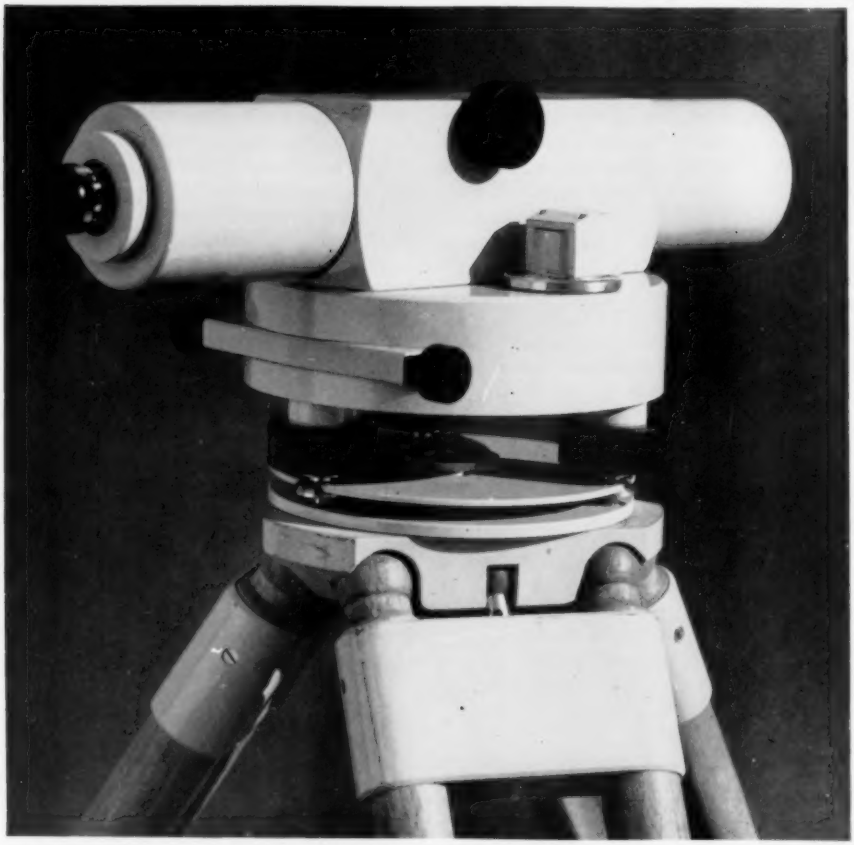

FIGURE 5.—Zeiss Opton Ni-2 Automatic Level.

ing piston within the damping cylinder, the cylinder being a shallow bore in the rear face of the pendulum. Thus resting, the heavier objective-end prism causes the back wires to be taut and the front wires slack.

The pendulum, the aluminum plate which passes vertically between the fixed prisms through an opening in the main support plate, is topped by a dome-shaped brass weight and cradles the compensating mirror (a right angle prism) at its bottom. A smaller weight, movable in a slot in the main weight, provides a means of shifting the center of gravity along the direction of tilt for centering the pendulum swing. Near the base of the pendulum is seen a screw (one of two) which may be screwed vertically into or out of the pendulum thereby raising or lowering the center of gravity for the magnification adjustment.

Figure 8 shows cross sections through the compensator along the optical axis and at right angles to it. Here the relative positions of prisms, pendulum, support wires, and damping device may be seen clearly. The support wires on each side of the pendulum are one piece, anchored at the ends on the prism support plate and bent to conform to the shape of the lower end of the pendulum.

The prism facing the objective is a relatively simple one with the entrance and exit

surfaces normal to the light rays. The swinging prism is a right angle with the hypotenuse the reflecting surface. The third prism reflects the rays to recover their original direction along the optical axis of the telescope. The three reflections result in an erect image which is reversed, that is, turned left for right. This reversed image is switched to appear correct by making the reflecting face of the third prism in the form of a roof.

THE PENDULUM

The shape of the pendulum is clearly shown in figure 8, with its prism at the bottom and brass weight at the top. The damping cylinder is a shallow cavity bored into the face of the pendulum, with the fixed, round disc which is the piston, fastened to the main plate of the compensator by means of an adjustable connecting block. Here may be seen the reason for transporting the instrument in the eyepiece-down position. The bulk of the pendulum mass is in the top weight, and, in the eyepiece-down position, the top of the pendulum comes to rest against the fixed end of the piston, with the front wires supporting the prism end of the pendulum and the rear wires slack. The objective-down position would be about as good, with the forward stop carrying the upper pendulum weight. Transporting the instrument on its side is to be avoided since the pendulum, resting against the edge of the damping piston, puts a shearing stress on the piston screws and might displace the piston.

A study of the complete telescope suggests that the swinging pendulum is probably the weakest element in the system. To determine if this weakness is serious or even if the term "weakness" is fair, a number of features must be considered. It is obvious that the wires can be damaged only by being placed in tension, and that a blow causing such tension must occur within a narrow range of direction. In the cross section, the clearance between the damping piston and cylinder walls is exaggerated, the actual clearance being only a few thousandths of an inch vertically and 10 to 15 thousandths horizontally. Of such forces occurring within this narrow angle, each wire can support approximately one and one-quarter pounds before yielding and about twice this

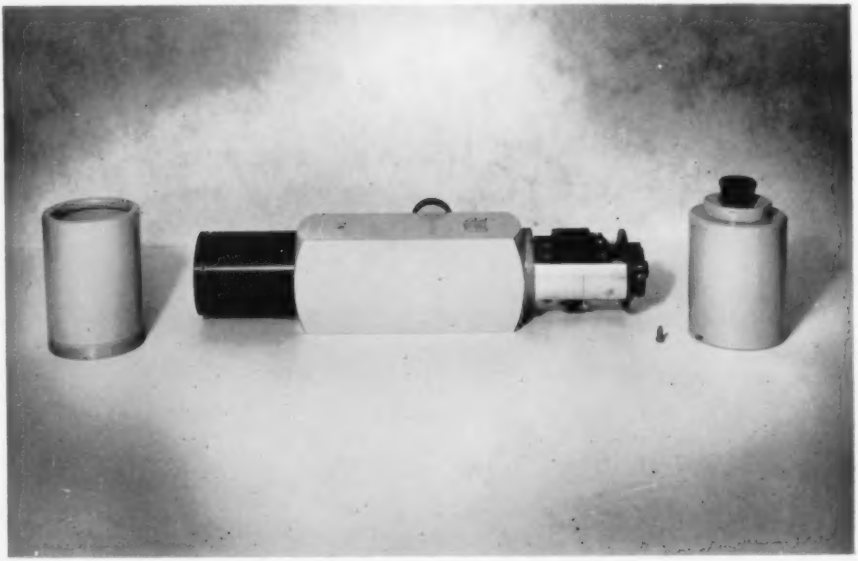

FIGURE 6.—Telescope with objective and eyepiece end caps removed.

amount before breaking. The weight of the pendulum is estimated to be less than one-tenth of a pound.

This provision of relatively strong suspension wires, relieved of all or most of the pendulum weight in any but the working position, makes for an instrument which will probably need little or no more care in handling than an orthodox instrument of equal precision.

COMPENSATOR FAILURE

One of the two men who field tested the U. S. Geological Survey level complained of sticking of the compensator. The report of the U. S. Coast and Geodetic Survey tests suggested that "busts" in their lines may have been due to the same trouble. With this in mind the possibility of such trouble occurring was investigated. With the compensator exposed and in working position it was possible to make the pendulum stick almost at will. A gentle push against the pendulum, perpendicular to its fore and aft swing, making it bump the piston, left it stuck more often than not. It was surmised that the slight lifting effect of the wires, together with the small bottom edge clearance between damping cylinder wall and piston was causing a tangential contact which would not free easily. Increasing the clearance between piston and cylinder wall did overcome the trouble but at the same time caused undue flexing of the wires with the instrument turned on its end.

This investigation led to the recommendation that the level be tapped before each sighting to be certain the compensator pendulum is free. However, in trying to get at the cause of some bad work done with the level in Kentucky, it was discovered that the taps had grown to lusty whacks. It was not proved that this caused the bad work but it certainly did not help. The solution, for those who suspect a sticking pendulum, is to notice if the image bobs with a quick turn of the horizontal tangent screw. This works in naturally with the use of the tangent screw in final pointing.

TELESCOPE DESIGN

Aside from the novelty of the automatic feature of the Ni-2 level, there are important innovations in the telescope design. As

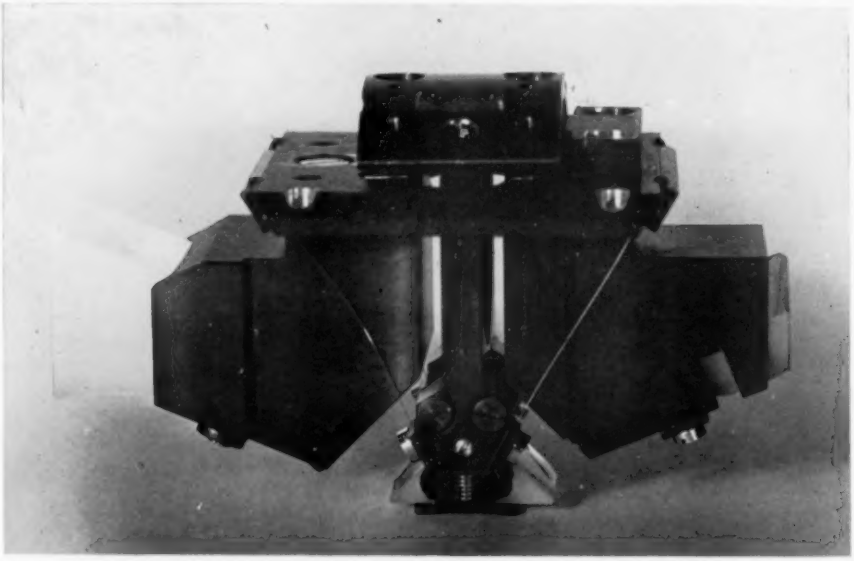

FIGURE 7.—Compensator removed from the telescope. Left side view with front prism at left.

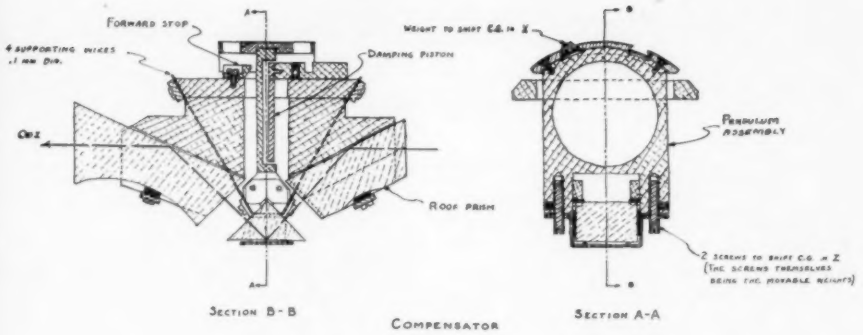

FIGURE 8.—Cross sections through compensator.

seen in figure 6, the body of the telescope is a heavy aluminum casting. The objective lenses are in a brass tube screwed into this body, and the compensator and reticle are mounted on heavy projections which are integral with the body. A heavy aluminum tube encases but does not touch the objective tube. A heavy brass tube protects the compensator and reticle, and supports the eyepiece at the rear. Thus thermal and mechanical shocks are transmitted to the heavy body casting without a chance of disturbing the collimation elements. The features just described probably are as important as the automatic feature in making it possible to do second-order work with no protection from sun or wind.

THE KENTUCKY JOB

Now a word about the trouble experienced by the U. S. Geological Survey in Kentucky. When it was learned that the two instruments on that job were failing to give good closures, and that reruns were being made with a standard prism-reading level, one of the most experienced levelmen in the Atlantic Region was sent to investigate. He finished the investigation without reaching any conclusions about what had caused the trouble. His own use of the Zeiss level cancelled out with one day of "busts" and one day of good closures.

Later this same man spent three days running back and forth over a one-and-one-tenth-mile course with with two Zeiss levels, one from the Kentucky job and one which had never been used. His report of this test concluded that the instrument will give good third-order results, but only when properly operated. All circuits that were run with third-order methods during the three days closed well within first-order accuracy.

The cause of the trouble in Kentucky was never definitely determined, although a good guess is there was too little knowledge of the instrument, too much emphasis on speed, and rods with inverted figures were used (the standard USGS level has an inverting telescope). The same men have since used the same instruments successfully in New England.

Field experience has shown a definite need for a sun shade while observing in early morning and late afternoon and, since the instrument case has no room for a rigid shade, the canvas tube fashioned by a Geological Survey levelman appears to be a good solution.

That the surveying profession is highly recognized in the British Empire is shown by the record that the Duke of Edinburgh was recently made an honorary member of the Royal Institution of Chartered Surveyors.

The New Cowley Automatic Level

EDITOR'S NOTE.—The following description and illustrations of a new builder's level were furnished by the United States distributor, Engis Equipment Co., 431 South Dearborn St., Chicago 5, Ill.

THE Cowley Automatic Level (figs. 1 and 2) is a compact little instrument that has been introduced recently to improve leveling practice in the building and other trades. It was invented in Australia to assist defense work during the war. Since then it has been manufactured in large numbers and come into widespread use, both there and in Europe.

The traditional methods of leveling involve the use of an expensive telescopic level for accurate initial setting out, and a number of more elementary devices, such as carpenters' levels, for simpler work. The telescopic level is accurate, but requires skilled handling, and is rather tedious to set up. One Cowley level can replace both the telescopic level and other leveling devices with great advantage in almost all normal work.

NO "SETTING UP"

The most interesting feature of the instrument is that it is entirely automatic. It is just placed in position on its tripod, and can be used at once, without any setting up or adjustment. There are no knobs, screws, or any other controls. It is quite foolproof and a normal person can learn to use it in a minute.

The accuracy is better than ¼ inch in 100 feet—very little less than that of the optical levels and more than good enough for normal building work.

The Cowley level has the further advan-

FIGURE 1.—The level and rod in use. The level is provided with a carrying case as shown. The horizontal bar on the rod slides up and down to serve as a target. The reading scale on the back of the rod may be read by the rodman.

FIGURE 2.—The Cowley automatic level. Note the absence of lenses, bubbles, and adjusting knobs, the compact design, and the lightweight inexpensive tripod.

tage of reducing the risk of error, since a positive reading of level differences can be obtained exactly as with the Dumpy levels. As a British builder said, "In the old days you spent all morning fiddling with a spirit level. Now (with the Cowley level) you do *this* and *this*, and there's your answer without any fuss." Moreover, it can be used in poor light and in conditions where other methods could not be used nearly as well, for example, at distances as short as a few inches or as long as 150 feet—or up to any distance, if intermediate stations are employed.

HOW IT IS USED

The Cowley level looks like a small, flat box, and is used on a light tripod with a special rod, on which a horizontal "target" slides up and down (fig. 1). When this is looked at through the instrument, it appears cut in two halves, left and right. These halves will only be level with each other when the target is exactly level with the instrument. The method of setting is very similar to that of a rangefinder, and is extremely sensitive. The height of the target is read directly from a simple scale in feet and inches (or meters) on the back of the rod. The operation is so simple that small children have used it successfully.

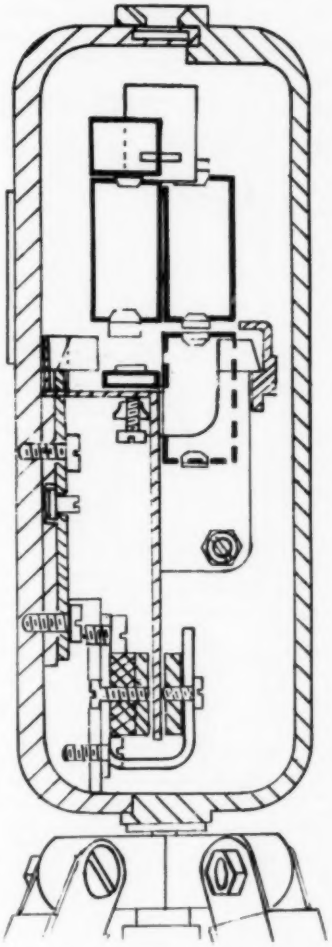

FIGURE 3.—End view diagram. The side-by-side mirrors, upper center, split the image of the target, reflecting the image as explained in the caption for figure 4. A plan view of the pendulum and its locking and supporting mechanism is shown.

HOW IT WORKS

Instead of using a spirit level, the Cowley level employs a sensitive pendulum suspended on knife edges (figs. 3 and 4). This carries a surface-aluminized mirror, one of a series of three which reflect the right side of the target upside-down to the eye. The left side is reflected by a series of two mirrors, and is seen upright. Accuracy depends on the precise positioning of these parts during manufacture, and the rugged mounting which holds them exactly in position, even during rough use.

The pendulum is stabilized magnetically and settles into its level position almost at once.

The construction is very strong. The

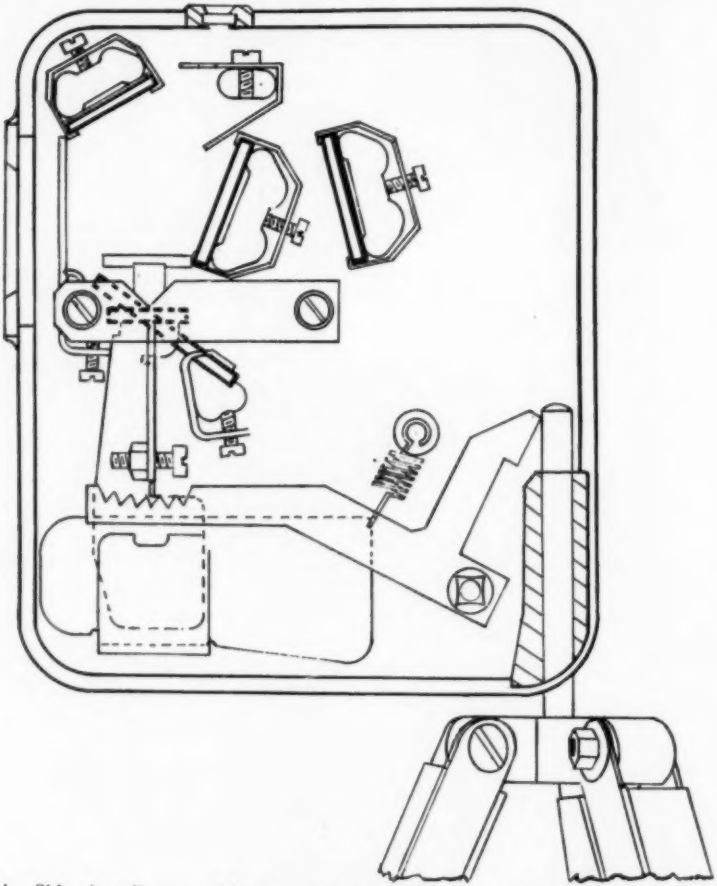

FIGURE 4.—Side view diagram of level mechanism. When the level is removed from the tripod, the spring pulls the pivoted arm upward engaging one of the notches on the stop latch, locking the pendulum in place. Light rays from the right side of the target (fig. 1) enter through the aperture, left, reflect upward from the left center mirror (left long mirror in fig. 3) to the upper left mirror, downward to the horizontal mirror attached to the pendulum, and upward to the eye. Light rays from the left side of the target reflect downward from the right center mirror to the larger inclined mirror alongside the pendulum, and upward to the eye.

mechanism is completely enclosed within an outer casing formed from precision die castings, and the pendulum is automatically locked when the instrument is taken off its tripod. It can then be carried about with no more precaution than would be given to any accurate tool. With reasonable care it will last indefinitely. The weight of the level and tripod together is less than 4¾ pounds. These qualities result in portability and robustness which enable it to be used under all kinds of climatic conditions.

Mark Hurd Firm Enters Photogrammetric Mapping Field

The establishment of a photogrammetric mapping division within Mark Hurd Aerial Surveys, Inc., was recently announced by Allan C. Bock, president of the firm. The new operation, which will include the compilation of topographic and planimetric maps as well as various types of mosaics, will be housed in recently acquired air-conditioned office space at the company's Minneapolis headquarters at 230 Oak Grove Street.

The Mark Hurd organization, pioneers in both the aerial photographic and camera manufacturing fields, has specialized in high-altitude photography in recent years, currently maintaining five P-38's specially modified for this work, in addition to four lower-altitude planes.

Photogrammetric activities will be under the direction of Joseph P. Burns, until recently stationed in Washington as a member of the technical staff of the Topographic Division, U. S. Geological Survey. Mr. Burns, a civil engineer, has specialized in photogrammetric mapping since entering the field in 1938 as a junior topographic engineer on the aerial mapping of the Tennessee Valley.

(Mr. Burns was Assistant Editor of SURVEYING AND MAPPING during 1953.—Ed.)

Reprints of Articles

Reprints in quantities of 50 or more may be obtained of any article appearing in this issue. Orders must be placed with the Editor-in-Chief, Robert C. Eller, Topographic Division, U. S. Geological Survey, Washington 25, D. C., not later than 3 weeks after publication. Authors who wish reprints of their articles may so indicate when manuscripts are submitted. Approximate prices of 4- and 8-page reprints follow:

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The Role of Monuments in Surveying

By BRUCE M. LARRABEE

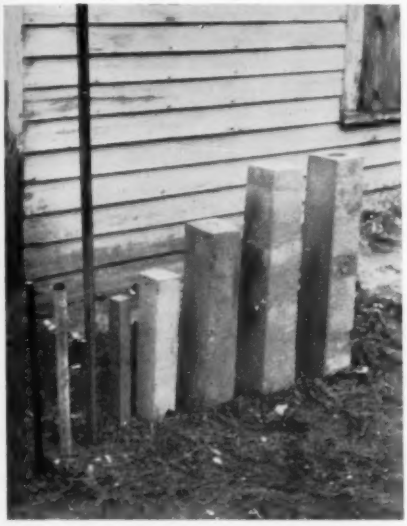
PROFESSIONAL ENGINEER AND LAND SURVEYOR, LAKEWOOD, N. J.

LAST SUMMER I saw a young man with a D–7 bulldozer rip out a sound 200-pound monument which marked the corner of a street. He was doing his daily job of grading and did not see the monument. I went over to him and asked if he knew it was a misdemeanor punishable by a maximum $1,000 fine and a year in jail to disturb a property monument. "I didn't know that," he replied, "I guess I will have to spend the rest of my life in jail then, if they catch up with me, because I knock them out all the time. I can't see the darned things because the blade hides them from view."

From a practical viewpoint, unless the monument was protected by a guard post 4 or 5 feet high and visible over the bulldozer blade, the operator may have a valid defense, because his acts were not intentional. Nevertheless, such an operator can innocently destroy monuments representing hundreds of dollars worth of surveying. The buried monument which is protected is more valuable because of the assurance that it will be unmolested.

A monument should be protected by a flag or painted pole which extends at least 5 feet above the surface. In Ocean County, N. J., our highway monuments are all buried 1 foot below the surface and protected with a 4- by 4-inch witness post set back usually 2 feet from the edge of the street line and containing a direction arrow point-

BULLDOZERS AND ROAD GRADERS ARE THE ENEMIES OF MONUMENTS. THE MONUMENT SHOWN IN THE PICTURE IS ABOUT TO BE DESTROYED BY THE GRADER BLADE.



ANY OF THESE MONUMENTS WILL STAY PUT IF PROPERLY SET

ing to the monument, showing the distance to the monument from the post.

WHAT IS A MONUMENT?

Millions of dollars in time are lost annually by surveyors who are looking for monuments which are difficult to find. And millions of dollars in work establishing control monuments are lost because previously established monuments are disturbed or destroyed. For monuments are the physical evidence by which we make boundary surveys. A boundary survey is merely a measurement between boundary marks, either found or set during the course of the survey.

Now, what is the true definition of a monument? Webster defines it as "a stone or other *permanent object* serving to indicate a limit or to mark a boundary." The *Encyclopedia Britannica* says, "a monument is a *fixed object* in the soil, whether natural or artificial, and referred to in a document and used as evidence for the delineation of boundaries, or the situation of a particular plot of land." The *New Century Dictionary* also holds to this definition of conveyancing in English law. Funk and Wagnall's *Standard Dictionary* defines a monument as "a stone or other permanent mark serving to indicate an angle or station of boundary."

A first class monument should possess four basic characteristics: permanence, stability, positive identity, and visibility. To these we might add the following, which contribute to its value: proof of no movement by referencing; a definite center or point; protective warnings against disturbances; surveyor's identification; coordinated location; protection from frost-heave; date of placement; a protective pole with flag to warn bulldozer operators; and, finally, accessibility by means of a small well when buried.

A surveyor spends the greater part of his time and effort in the task of measurement, proof of measurement, and the preparation of drawings to show that measurement. Nevertheless, in disputed cases, the law courts, time and again, will disregard measurements and recognize monuments. The

THIS STONE MONUMENT IS 40 MILES FROM WHERE SUCH A STONE COULD BE FOUND NATURALLY. IT WAS CALLED FOR IN AN ORIGINAL ENGLISH LAND GRANT BY THE PROPRIETORS OF NEW JERSEY IN 1795.

reason for this is that the cause for dispute is a conflict due to inaccuracy in the original survey. If the original survey preceded the description, the evidence on the ground is considered more certain. However, if the description precedes the survey, and the surveyor made an error in executing the intent of the scrivener of the deed, the monuments will not control unless the established lines of possession have endured for a long period of years.

The question often before the surveyor is "What are the facts?" Sometimes he is unable to find out. He is puzzled, and must use his best judgment. The client has little sympathy because the surveyor is puzzled. He wants the surveyor to show him his true boundary and that is all he cares about. He will not assume the added cost of permanent monuments after he learns the cost of the measurement. He instructs the surveyor to use a 10-cent stake to establish a bound point, the location of which may have cost up to several hundreds of dollars. Or maybe the client decides to put in his own private monument later.

MONUMENTS THAT STAY PUT

In New Jersey the legal size of monument for subdivision control at street intersections is defined in the statutes as "a 6- by 6- by 30-inch object of permanent, durable material." In Massachusetts, legal land court monuments are of a minimum size of 4- by 4- by 36-inches, and made of stone or concrete. In California, 2-inch pipes are used extensively.

Nine out of ten corners established today are marked with wooden stakes, because they drive easily and cost the surveyor little money. But the wooden stake is the lowest class of monument. In fact, courts have ruled in some cases that a wooden stake was not a monument because it lacked permanence.

Natural boundaries such as paved roads, edges of fields, blazed trees, rivers, and shore lines have obtained great importance as controls of boundary because of their permanence and resistance to the efforts of man to move them. The current rapid destruction of bound points, however, tends to reduce the rewards to the surveyor from the practice of surveying, for he is forced to use more time in getting started on a survey. Therefore, surveyors have a definite responsibility in trying to reduce this destruction. Few of the public know that it is a criminal act to disturb or destroy survey monuments. And they will never be better informed unless surveyors make this fact known on the monument.

Surveyors, while they should learn to bury monuments, should at the same time make them easy to find by placing a well over the monument, with a cap containing a warning. The use of bronze caps on top of concrete monuments, for instance, can provide positive identification, a warning against violation of the law by disturbing or destroying, the name of the surveyor who placed the monument, a place for grid coordinates where States or cities have such a system, and the date of placing. This type of bronze cap is now available by mail from

CONCRETE MONUMENT WITH BRONZE MARKER SET IN PLACE

New Jersey in small lots at nominal cost. They have everything mentioned above cast into the cap except the number, coordinates, and date which can easily be stamped on by the surveyor. Another manufacturer in California makes cast bronze caps in blank form so that all the data may be stamped on by hand in the field. These caps are distributed by Warren-Knight in Philadelphia and Leitz Company in San Francisco.

There are now under consideration certain modifications of New Jersey statutes which have been recommended by the New Jersey Society of Professional Engineers. In these recommendations the Society has set forth a minimum requirement for monuments used in subdivision control. The idea is to provide for future casualties of monuments. The recommendations require that at all street intersections where street alignment continues as a straight line, there shall be one monument at each of two diagonally opposite corners. In all cases where either of the streets does not continue through the intersection as a straight line, all the four corners shall be monumented.

The monument referred to in the recommendations is defined as being of durable, permanent, hard material, 5 inches square at the top and 7 inches square at the bottom, with a total height of 30 inches. The reason for the taper is to provide resistance to frost-heave action.

RECOVERING MONUMENTS

The value of referencing a monument to a tree, spike, a building corner, or other reference point, is well known. However, two reference points are hardly enough. When a survey discrepancy between the references and the monument occurs, two references will not show whether one of the references or the monument has been disturbed. If there are three references, however, it is possible to determine which of the four objects may have been disturbed. In practice, the difficulty of determining whether or not a monument is in its original location often raises the question of the acceptance of a monument which is not adequately referenced. Sometimes several monuments are found, only one of which is the original and will control a corner.

The problem of monumentation of subdivisions is often complicated by the actual construction of roads and pipelines during the development of the property. When the engineer does not control the location of the installation of the pipelines they are invariably located by the utility company along a line of monuments. In New Jersey the statutes provide for the deferred installation of control monuments by the developer, providing he puts up a bond which will be a guaranty to the local government that the monuments will be installed when grading and other construction is completed.

The matter of identification and age, therefore, become an important factor in the acceptance of the true corner Too often a surveyor is expected to pass judgment on a boundary without an understanding of all the facts which may later be brought out and of which there was no knowledge at the time of the original judgment. Perhaps a buried monument will be unearthed which will prove that a hidden corner, found by others, is the right corner.

The north boundary of the State of New Jersey was established by a surveyor upon an order issued by the legislature in 1773. The easterly end of the boundary at the Hudson River was originally described as beginning at latitude 41 degrees north. While the monument pictured with this article is the original controlling monument, it is an appreciable distance from the intended location of the boundary. The use of a compass in surveying the line caused a deviation of up to one-half mile from a straight line. But the monuments control the line.

GOOD MONUMENTS SOLVE PUZZLES

Surveyors often have problems which are very puzzling. One arrives at the end of a long line in a wooded tract, and finds three corners, all within a 20-foot circle. All are field stone, minus dates or anything else to distinguish them. Which one is the oldest? Which controls the corner? The others may have been set by surveyors with little knowledge of the order of calls for the control of boundaries. In such cases a monument containing the date of placement, the name of the surveyor, or an identifying number called for in the deed, would afford an answer to the puzzle. To provide such information, thus making a monument more certain of control, cast bronze tops are today readily available, at a nominal cost. A high class artificial monument is a readily marketable item for the surveyor in States where no grid

EAST END OF BOUNDARY BETWEEN NEW YORK AND NEW JERSEY AT HUDSON RIVER AS MARKED AT TIME OF DIVISION

pattern of sectional control of boundaries exists. The present price range is from $10.00 to $15.00, set in place.

The Bathey Co., Plymouth, Mich., manufactures a stamped brass cap which can be attached to a steel T-section stake or wooden stake. The cost runs from six cents to about half that, depending on the quantity ordered. The standard lettering on the top defines the object as a "survey point" with the letters R.L.S. and the license number of the surveyor The cap also contains the wording "Do Not Disturb—$100.00 Fine." The steel stake will interfere with a needle and may cause trouble in retracing lines referring to a magnetic bearing, where only one corner is known to start with. However, a dip-needle or electronic detector will react to this type of monument, which can be found easily when it is buried. A cast bronze top, of course, has no reaction to a needle, and it contains the actual name and identification of the surveyor on top.

In cases involving boundary disputes, it is wise to investigate the cause of overlapping lines from the standpoint of the abuttor as well as the client. This may result in some dissatisfaction by your client and the writer has charged off many dollars of work to overhead in cases of this kind. The client is very reluctant to pay for sad news. Long-time physical possession and recognized monuments of long standing, when not disturbed, will control in general over descriptions which conflict by reason of errors or inaccuracies. Many descriptions are written without surveys. Title policies are issued subject to what a survey may show. The intent may be vague, indefinite, erroneous, conflicting, and impossible of interpretation. Surveyors must have courage to refuse to survey lands described as beginning from theoretical points and running with indefinite bearings and "more-or-less" distances to other theoretical points on the ground. We must have monuments or coordinate points adequately referred to monuments in order to know how to measure. Worthless descriptions only encumber the land.

One of the important services today's surveyor has to offer is that of providing a definite, accurate land description which will be adequate to permit any competent surveyor to retrace the lines in the same location. Permanent monuments are a basic requirement in such a description.

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Streamlining Local Control

By C. A. WOOLDRIDGE, JR.

SECRETARY, EAST BAY COUNCIL ON SURVEYING AND MAPPING[1]

HOW do you file control monument data? Do your maps show you when you have control stations near a proposed project or property survey? Who established control monuments and how do you know when such work conforms to the legal requirements for control in your State? Where do you find out about these control monuments and how can you be sure that you know of all control work in an area?

These, especially the last, are typical of the problems confronting anyone preparing to use the State Plane Coordinate System. Various solutions have been found in certain areas. Some States followed the model act to legalize the coordinate system and establish or designate an agency to maintain a file of control monument data. In altogether too many localities, the problems remain unsolved.

The 1947 act adopting the California Coordinate System requires that "Any survey or map purported to be based on the California Coordinate System shall have established conections to at least two" control monuments which are "triangulation or traverse stations established in conformity with the standards adopted by the United States Coast and Geodetic Survey for first-order and second-order work."

About the time this law was enacted, the East Bay Municipal Utility District was having difficulty extending local surveys and maps based on old independent surveys. The District authorities were quick to recognize the value of the State system of plane coordinates and were instrumental in obtaining the participation of several sponsoring agencies in a cooperative project with the United States Coast and Geodetic Survey.[2] The District is a public corporation comprising the metropolitan area along the east side of San Francisco Bay and including 14 incorporated cities in the western portion of two counties. In all, local contributions of $60,000 were provided by the District, Alameda and Contra Costa counties, and eight cities. The Coast and Geodetic Survey probably spent about the same amount with the resulting control frequency of 7 miles in the rural portions of the counties to 1 or 2 miles in metropolitan areas. The City of Alameda special traverse produced a quarter-mile grid, approximately.

Since that time 20 or more organizations, including Federal, State, and local agencies, and private engineers and surveyors have been extending the control for various projects. While there has been cooperation and an exchange of information between agencies, much effort has been buried in the files and a considerable amount of duplicate work has been performed. It was not uncommon to discover another organization's control monument adjacent to a point being established, even though an investigation had been made to discover available work in the area. To solve problems such as these, the East Bay Council on Surveying and Mapping was organized.

It was recognized that a central source for all control data was necessary. The most practical location for these records seemed to be the county offices, and the two County Surveyors readily agreed to maintain the necessary files.

To standardize the procedures in the two offices, a study of the necessary and desirable features of such records was made. Each agency working with coordinates in the two counties had its own forms, filing methods, and type of index maps. To place copies of

[1] Since writing this paper, Mr. Wooldridge has been succeeded as EBCSM Secretary by Al Milano, P. O. Box 390, Martinez, California. Albert E. White is Chairman for 1954.

[2] *See* "East Bay Triangulation Net," page 191, July–December 1947 issue of SURVEYING AND MAPPING.

these original records in the County Surveyors' offices would help, but a considerable amount of confusion would still exist.

The various monument record forms were of different sizes and contained different items. Many agencies had adopted the United States Coast and Geodetic Survey 5- by 8-inch card, usually with modifications and frequently needing two or more for a station. Others had adopted 8½- by 11-inch forms and some agencies had no records other than field notes and computations.

The letter size, 8½ by 11 inches, was adopted (*see* illustration) and considerable thought was given to the data required on the record. Since almost all of the users of these records would be working on a plane grid base rather than geodetic datum, the lists of directions should be given in grid azimuths. Vertical data is essential and, if possible, the accuracy of the station position should be given with more information than just the statement of order. Space was provided for such remarks as "9,000-foot traverse closure, 1:17,000; average angular adjustment, 2.3 seconds." A half page is left for description, plat, and remarks. This includes a regular description of the type of monument, stamping, distance above or below surface, ties to roads, fences, structures, property lines, directions for reaching the station, and a sketch if available.

This data is all typed (and sketches traced) on a tracing paper form from which diazo prints can be immediately produced when copies are desired by the surveyor. As a routine filing matter, prints are made for certain organizations when a new record is filed. These records are then filed in the most logical manner for a coordinate system —by coordinates. Arbitrarily, it was decided to list the "y" (north) coordinate first on the form, so the filing is done in groups of 10,000 feet in the "y" coordinate. Within each group, all records are filed by the "x" coordinate numerically.

Each record, as it is placed in the files, is plotted on the index map. Symbols represent the various types of points: triangulation, traverse or intersection, and primary control (stations published by United States Coast and Geodetic Survey); supplementary control (after being accepted as such by a committee); and non-control (all stations not published by United States Coast and Geodetic Survey as first or second order nor accepted as supplementary control by the classification committee).

These index maps are tracings of the Geological Survey topographic quadrangle sheets at a scale of 1:24,000 (1 inch = 2,000 feet) with 1,000-foot grid lines added. In the metropolitan areas, quarter sheets at 1: 12,000 are used and, being on tracing cloth, diazo prints are available to organizations desiring them. Because of filing by coordinates, the maps are not cluttered with station names. A cross index to obtain coordinates from names is, of course, maintained.

Vertical control is recorded on these same forms. Many stations are precise benchmarks as well as horizontal control stations. Others have elevations obtained by vertical angle and some have elevations scaled from the index maps. Benchmarks are plotted on the index maps and their coordinates scaled for inclusion in the same files.

Many agencies have adopted this standard form for monument records, including some who originally felt that they had too much work on the old forms to convert their files. All agencies new to the coordinate system are adopting this form and much duplication of effort has been eliminated as records no longer need to be reproduced on different forms.

The standard monument record form was devised by a Technical Committee of the East Bay Council, headed by John S. Bates, Consulting Engineer. This committee has presented a series of numbered technical reports to the Council as follows:

1. Indexing and Filing Control Data
2. Frequency of Horizontal Control Monuments
3. Standard Monument Record Form
4. Recommended Vertical Control and Datum Plane
5. Suggested Procedures for Making Local Ties to the California Coordinate System
6. Specifications for Control Monuments
7. Field and Computation Forms

ZONE III

MONUMENT RECORD
CALIFORNIA COORDINATE SYSTEM

SHEET 2 OF 2

HORIZONTAL CONTROL DATA	
TYPE-	Supplementary Control Triangulation
ORDER-	Second average triangle closure 2"3 average direction correction 0"9
AGENCY	EBMUD COP Dolan

LATITUDE	37 ° 47 ' 59 " 626
LONGITUDE	122 ° 15 ' 42 " 892
Y (NORTH)	478,086.49
X (EAST)	1,490,957.06
STATION (NAME, SET BY, YEAR SET)	FAKE - EBMUD - 1949 - R 1951
(YEAR RECOVERED)	
INDEX SHEET (QUADRANGLE SHEET)	Tassajara SE ¼
ALAMEDA COUNTY	X
CONTRA COSTA COUNTY	
OTHER COUNTY	

VERTICAL CONTROL DATA	
ELEVATION IN FEET	DATUM
247.232	MEAN SEA LEVEL
244.243	City of Oakland
ORDER-	Second .039 Feet in 1.9 miles
AGENCY	State Highway COP Milano

TO STATION OR MARK	AZIMUTH CLOCKWISE FROM GRID SOUTH	GRID DISTANCE IN FEET
GRID NORTH	180°00'00".000	
TRUE NORTH	181° 04' 43"	
False-USC&GS	27° 16'27"5	10,218.64
Boggs-Oakland	129° 57' 16"8	12,714.69
Godman-EBMUD	219° 51' 37"4	9,853.29
Fox-EBMUD	270° 19' 47"3	316.21
RM 1	319° 24' 07"6	80.63

ESTABLISHING AGENCY'S REFERENCE
VERTICAL DATA: Route 673 folder
HORIZONTAL DATA: FB 163 - Concord Tank Calc.

COMPLETED: Apr.1951
CHECKED:
Aug.1949

COUNTY SURVEYOR'S REFERENCE
VERTICAL DATA: C.C.S. 26
HORIZONTAL DATA: C.C.S. 12

VERIFIED:

RECEIVED: Mar.1951
Aug.1949

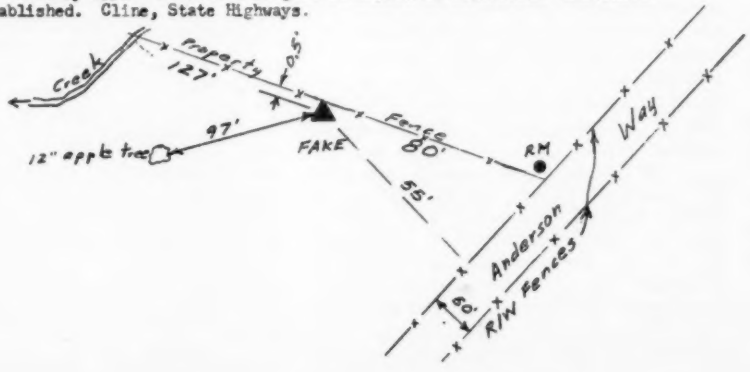
DESCRIPTION, PLAT, REMARKS, ETC.:

Supersedes sheet 1 of 1, now including vertical control. Station is about 2 airline miles southeast of the Oakland City Hall and is a standard EBMUD bronze control survey disc stamped FAKE 1949, set in a concrete monument flush with the ground. It is about 6 inches south of a property line fence and about 55 feet northwest of the northwest fence of Anderson Way.

The reference mark is a 3 inch pipe filled with concrete with a brass pin and tag LS 9841 set at the most easterly corner of the land of J. Jones described in deed recorded in book 8912 of Official Records of Alameda County at page 65. It is about 4 inches north of a property line fence and about 7 inches northwest of the northwest fence of Anderson Way.

To reach from the intersection of Hill Street and Grant Avenue in Oakland, drive southeasterly along Hill Street for 1.7 miles to Anderson Way; left (northeast) on Anderson Way for .25 mile to house number 19281 Anderson Way and station on left as described.

January 1951 - Recovered in good condition as described. Elevation established. Cline, State Highways.



EBCSM-1
2-6-53

8. Recommended Checking Procedures
9. (not available)
10. Specifications for Control Surveys
11. Local Ordinance for Monument Protection
12. The Value of Control

Since the formation of the East Bay Council on Surveying and Mapping, many organizations have become aware of and approved the coordinate system. More important, however, is the increased use of the system and the number of agencies that are now establishing control stations.

Seventy-fifth Anniversary of Geological Survey Observed

ON April 21, the Washington Society of Engineers and the District of Columbia Council of Engineering and Architectural Societies sponsored a meeting in the Interior Department auditorium to commemorate the 75th Anniversary of the founding of the U. S. Geological Survey.

In commenting on the history and program of the Geological Survey, Secretary of the Interior Douglas McKay called attention to the non-controversial nature of the Survey's program. Assistant Secretary Felix E. Wormser pointed out that the Survey's accomplishments have been of great value to the nation and commended the agency for its efficient operations.

James E. Fox, President of the Washington Society of Engineers, introduced Walter C. Mendenhall, Director of the Geological Survey from 1931 to 1943, and called attention to the large number of Survey employees who have been members of the Society. Before introducing the speakers on the program, Bernard E. Locraft, President of the District of Columbia Engineering and Architectural Societies, referred to the great advances in the field of mineral development during the past 75 years and recounted the many uses of topographic maps.

Dr. William E. Wrather, present Director of the Geological Survey, described briefly the bureau's history under the title of "Seventy-five Years of Scientific Investigations." He pointed out that there were four expeditions for exploration and mapping in the West during the 1870's with similar objectives and somewhat overlapping areas of operation. The legislation recommended by the National Academy of Sciences and approved by Congress in 1879, Dr. Wrather stated, defined the functions of the Geological Survey as ". . . the classification of the public lands and examination of the geological structure, mineral resources, and products of the national domain." He reported that the Survey now has approximately "6,500 employees, two-thirds of whom are engineers or scientists."

The principal operating programs of the Survey were described by Dr. Wilmot H. Bradley, Chief Geologist; Harold J. Duncan, Chief, Conservation Division; Carl G. Paulsen, Chief Hydraulic Engineer; Gerald FitzGerald, Chief Topographic Engineer; and Robert L. Moravetz, Chief, Publications Office.

In describing the work of the Topographic Division, Mr. FitzGerald reported that the Geological Survey is now producing more than 1,500 topographic quadrangles a year, but that there is still a long way to go to complete the National Topographic Map Series. "During the past twenty years," Mr. FitzGerald stated, "all topographic maps produced by the Survey have been made with the aid of photogrammetry. The methods and techniques we use today are producing maps faster, better, and more economically than ever before."

The Geological Survey has also been honored by the American Association for the Advancement of Science. A guest editorial by Dr. Wrather and digests of ten manuscripts describing current research by the Survey were published in the March 5 issue of *Science*. Additional reports of Geological Survey activities were scheduled to appear in a later issue of *Science*.

C. P. VAN CAMP

Surveying Tidal Lands in Texas

By J. STUART BOYLES*

REGISTERED ENGINEER AND LAND SURVEYOR, HOUSTON, TEXAS

TIDAL land boundary in Texas dates from the adoption of the Constitution of Coahuilla and Texas on August 18, 1824, at which time the littoral leagues were reserved to the exclusion of aliens.

The rivers and the sea were arterial highways to the early settlers and under Spanish law were very properly reserved to the Crown for the benefit of all its citizens. The coastline has ever been of material importance. In case of war these could become the possible invasion areas for enemies. This fact was thought to be of great importance by the Spaniards and as a consequence the littoral leagues were reserved for Spanish citizenship only.

It is human nature for one to claim everything possible. Naturally, along the seashore the question of ownership of marsh or tidal lands comes into controversy. The average property owner misconstrues the nature of riparian rights and confuses the privileges granted with ownership.

In Texas, the question of tideland boundary location was under discussion as early as October 20, 1826. This is evidenced by a letter from Guerra, Head of the Executive Department of the Free State of Coahuilla and Texas to Manuel de Mier y Teran, Inspector General of the Eastern Internal States of Mexico, containing the following instructions: "In regard to the 1st, the surveys shall be commenced from the edge of firm lands (terra firma) leaving to the sea the lakes that have communication with the same, as they shall be considered as a part of one whole, not so the lakes or salt marshes, *which are separated from the Sea and surrounded on all parts by firm land.*" (Emphasis added.)

Today, with oil and gas being produced from submerged areas, the location and definition of the boundary between tidelands (lands covered and uncovered by the tides and generally State owned) and uplands (land above the ebb and flow of the tide and generally privately owned) assume major importance. The location of this boundary requires accuracy and exactness.

BOUNDARY BETWEEN TIDELANDS AND UPLANDS

On Government grants, the boundary of lands adjacent to the seashore is held to be actual shoreline, rather than the traverse or meander lines set out in the patent; and the Federal Government has no power to dispose of tidelands which are uniformly held to belong to the States as an incident of sovereignty. The rights of a patentee under a Government grant are thus limited to the upland.

By the common law, when the sea is named as a boundary, the line of ordinary high-water mark is always meant. This is pretty well agreed upon. But what has not been so well established is the exact meaning of the term "ordinary high-water mark." Some of the State courts, for example in California, have construed the term to mean the line of the neap tides—that is, tides which occur twice a month when the moon is in its first and third quarters. Tides then do not rise as high nor fall as low as usual. (See *Techemacher* v. *Thompson,* 18 Cal. 11.)

Insofar as the Federal courts are concerned, the matter was fully considered in the case of *Borax Consolidated Ltd.* v. *City of Los Angeles,* 296 U. S. 10 (1935). In determining the limit of a Federal grant, the Supreme Court of the United States construed the term "ordinary high-water mark" to be the line of the mean high tides, which it said was "neither the spring tide

* Mr. Boyles made the first surveys for the State of Texas on submerged areas. That was in 1913. Since then he has made many surveys involving the boundary of tidelands.

nor the neap tide, but a mean of all the high tides."

To establish the line of ordinary high tides, the Court said further: "In view of the definition of the mean high tide as given by the United States Coast and Geodetic Survey, that 'Mean high water at any place is the average height of all the high waters at that place over a considerable period of time,' and the further observation that 'from theoretical considerations of an astronomical character' there should be a 'periodic variation in the rise of water above sea level having a period of 18.6 years,' . . . in order to ascertain the mean high-tide line with requisite certainty in fixing the boundary of valuable tidelands, . . . 'an average of 18.6 years should be determined as near as possible.' "

The decision in this case should be read and studied by all engineers who expect to do surveying along the coastline in order to segregate the tidal lands from the title lands. The leading English case on the subject is *Attorney General* v. *Chambers*, 4 De G.M. & G. 206, 43 English Reprint 486 (1854), in which the boundary line between tideland and upland was held to be the "medium high tide between the springs and the neaps."

On the use of shorter-period observations than that indicated by the Court in the *Borax* case, the following statement from Special Publication No. 135 (Tidal Datum Planes) of the United States Coast and Geodetic Survey is pertinent:

> "Mean high water at any place is the average height of all the high waters at that place over a considerable period of time. To determine just how long a series of tide observations is required to derive a satisfactory value of mean high water it is necessary to consider in detail the variations to which high water is subject.
>
> ". . . These variations, which are of a periodic character, are due to changes in the position of the moon with respect to phases, distances, and declination. . . .
>
> "The daily height of high water is subject to relatively large variations both periodic and nonperiodic in character. The periodic variations depend primarily on the phase, distance, and declination of the moon, the periods of these being approximately 29½, 27½, and 27 1/3 days respectively. Such variations are, therefore, largely eliminated within a month. And, within a month, too, the large variations in sea level due to wind and weather tend to balance out. It follows, therefore, that a much closer approximation to the plane of mean high water can be secured from a month than from one day of observations.
>
> ". . . Within the same year the monthly heights of high water may differ by as much as a foot."

ESTABLISHING THE HIGH-WATER LINE

When a surveyor is once on the ground the surveying of tidal lands is not an involved problem. It is substantially the same as river or stream meandering. In tidal surveying the meandering is between stations previously set by the leveling party at convenient points on the ordinary high-tide line. Getting on the ground with the proper data is a long and complicated proposition.

The nearest United States Coast and Geodetic Survey (USC&GS) primary benchmark should be located. In the absence of primary, the nearest secondary benchmark should be located and the corrected elevation obtained from the USC&GS. A complete, closed level circuit should be run, establishing frequent, intermediate benchmarks along the coastline. This is of primary importance in Texas because of the small range of tide. These intermediate benchmarks provide a ready check against elevation errors, which can easily creep in because of the usual strong winds along the coast and the general instability of the ground over which the survey is being made.

After the intermediate benchmarks have been established and the actual measurements or meandering begun, it has been found expedient to use at least two crews, one on the transit and one on the level, with one or more extra rodmen, all working together as one surveying party.

It is of course impractical to measure every small contour bend. After establishing meander points on what has been determined as the ordinary high-tide line, the small sinuosities can be accurately determined by plusses between stations and by

right and/or left measurements to the actual contour. The level and transit parties working together with extra rodmen make this an easy matter. When the traverse has been closed, plus or minus values can be readily ascertained for the acreage calculation. This is important in oil work as it is a general custom to base the oil production allowable on an acreage basis.

Maps should be made on a thousand-foot scale. This scale is suggested because many of the aerial photographs can be blown up to this scale without too much distortion. An excellent comparison and check on the meanders can thus be obtained.

The greatest difficulty in tidal surveying in Texas comes from a lack of primary benchmarks, their remoteness from the work, and a lack of sufficient continuous tide gauge readings to arrive at a definite ordinary high-tide line in any particular area.

The elevations of the United States Engineers (USE) benchmarks have been established rather arbitrarily and cannot be used to obtain true ordinary high-tide data unless correlated to the corrected USC&GS circuits. For example, the USE elevation at Galveston is 0.89 foot above mean sea level used by the USC&GS. At Corpus Christi, the USE elevation is 0.83 foot above the USC&GS datum. (This information is based on correspondence with the Engineers). In both instances actual checks have been made by the writer on the ground between the USE and USC&GS benchmarks. At Galveston, the actual difference developed to be 0.96 foot and at Corpus Christi 0.83 foot. It is interesting to note that from the USE datum as of 1889 the mean high tide at Galveston was 1.53; in 1890, with more records available, it was 1.57; in 1891, with still more data, it was 1.63; and in 1892 it was 1.68. These figures give an average of 1.605 and show a definite increase in the height of observed high tide as the period of observation lengthens.

From the daily twenty-four hourly observations at Galveston between the years 1916 and 1937, using only the highest daily tide recorded (dropping all storm tides), a variation in elevation is obtained, ranging from a minimum of 1.560 in 1917 to a maximum of 2.563 in 1929, with a mean value of 2.0417.

In Texas, surveys made prior to the effective date of the introduction of the common law, in April 1840, are governed by the civil law as applied in Spain and Mexico. Riparian land grants on the Gulf carry title up to the line of the highest winter tide, and the State owns all land below the line of the highest winter or storm tide. See *City of Galveston* v *Menard*, 23 Tex. 349; *Manry* v. *Robison*, 56 S.W. 2d 438.

Under Spanish Law, it is provided in "Las Siete Partidas" (Part 3, Title XXVIII, Law III, at page 820) that: "The things which belong in common to the creatures of this world are the following, namely: the air, the rain-water, and the sea and its shores, for every living creature can use each of these things, according as it has need for them. For this reason every man can use the sea and its shore for fishing or for navigation, and for doing everything there which he thinks may be to his advantage." And Law IV, at page 821 states: ". . . and all the ground is designated the shore of the sea which is covered with the water of the latter at high tide during the whole year, whether in winter or in summer."

Surveys made since 1840 are governed by the common law and the State owns only up to the ordinary high tide. This is borne out by an opinion of the Attorney General of Texas under date of September 29, 1930, defining tidelands as those which "Include all lands lying seaward from the line of ordinary high tide that is covered from time to time by such a tide."

In my opinion, the adoption of the common law in Texas did not intend to break away from the Spanish definition of tidal lands, but to clarify it by averaging all of the daily highest tides into a mean or average highest tide as against a possible exceptionally high tide in the winter. From my personal observations, covering a good many years of actual work along the coast, there is little, if any, difference between ordinary high tide and the high storm tide in the winter.

A Method for Computing Charges for Land Surveys

By R. C. BRINKER

PROFESSOR AND HEAD, CIVIL ENGINEERING DEPARTMENT,
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ONE of the problems of the surveying profession is the "week-end warrior"—the fellow who picks up a few extra dollars on Saturdays and Sundays doing cheap surveys. Engineers, students, professors, and others with no practical experience borrow or rent some equipment, ignore the registration law, and make land surveys for peanuts or a friend.

In order to convince students that good surveys are not sold at cut-rate prices like over-ripe bananas, the writer gives an annual "surveying costs" lecture. The fundamental procedure described can be applied with simple modifications to determine the cost of operating a consulting office or small business and is therefore pertinent to engineers as well as land surveyors.

Charges for surveying may be split into two classifications:

Expenses charged directly to the job.
Expenses charged indirectly to the job.

Expenses charged directly to the job may be broken down as follows:

(1) Payment for time in field and office, including title searching and travel time.

(2) Cost of materials used such as monuments, stakes, paper, etc.

(3) Transportation (gas, oil, tires, etc.) and cost of meals and lodging when away from home.

(4) Ten percent profit on all cash expenditures such as salaries and materials. This covers bad debts on the theory that those who pay their bills also pay for those who do not.

(5) Interest at ten percent per annum on any out-of-pocket expenditures for period from time of disbursement to estimated date of payment. This prevents the surveyor from becoming merely the middleman for the bank if he borrows money to meet his current payroll or other costs.

Expenses charged indirectly to the job include:

(1) Office rent, telephone, and lights.
(2) Interest on cost of office equipment.
(3) Depreciation of 10 to 25 percent annually on equipment.
(4) Registration and other license fees.
(5) Charge for time occupied in writing reference office data, filing, etc.

The investment required for equipment and office are:

Item	*Cost*
1 Transit, 30-second instrument or better	$ 750
1 Engineer's level	350
2 Range poles	18
2 Level rods	88
2 Steel tapes, 100 feet long, graduated to hundredths	45
2 Metallic tapes, 50 feet long, in cases	20
2 Axes, brush hooks, sets of pins, plumb bobs, magnifying glasses, etc.	40
1 Drafting table and stool	125
1 Set of drawing instruments	75
1 Desk and chair	150
1 Typewriter	140
1 Map filing cabinet	250
1 Set of sectional bookcases	60
X Professional books	75
1 Calculating machine, electric, automatic	775
1 Ozalid printing machine	450
1 Station Wagon	2,500
X Triangles, protractors, French curves, miscellaneous	89
Total	$6,000

The standard equipment listed is a minimum. Additional desirable, if not necessary, items of equipment are 2 stadia rods, $70; 1 planimeter, $60; 2 hand levels, $30; 2 circular spirit levels, $8; 1 planetable outfit, $475; 1 right-angle prism, $20; etc.

The cost of maintaining an office and running a field party for a calendar year is de-

termined as follows:

Interest at 6% on $6,000	$ 360
Depreciation at an average of 10% per annum	600
Rent, telephone, and other office expenses at $100 per month	1,200
Insurance on car, personnel, and business	500
Wages, including social security and payroll tax payments:	
2 Rodmen (chainmen) at $220 per month	5,280
1 Instrumentman at $350 per month	4,200
1 Party chief at $400 per month	4,800
Total	$16,940

The first four items making up the total annual expense of $16,940 are indirect but fixed charges. Assuming 260 working days per year (excluding Saturdays, Sundays, and holidays), the cost per day for fixed charges is $2,660/260 = $10. Obviously, this amount is a drain on the surveyor's checking account whether he works or fishes, whether his employees are sick or on vacation.

Wages are indirect charges and may be varied somewhat. In order to maintain an efficient organization, however, the men must be employed continuously. If this is done, the wage item becomes a fixed charge also.

The cost of running a survey party of four then is $16,940/260 or about $65 per day. To this amount should be added at least 10 percent for business risk, making the total approximately $72 per day. Finally, expenses charged directly to a specific job must be superimposed.

The example given is for one party only and, like all cost data, must be adjusted to fit time, location, and other conditions. Special taxes, long-term requirements for map storage, and other expenses may be considerably more than the amounts tabulated. Some of the items of equipment might serve additional parties but the need for a second station wagon, a draftsman, and supervisory personnel would overbalance any saving resulting from that possibility. A secretary for general office duty is necessary in a large office.

Several other methods of computing charges are available. A minimum fee of $90 per day for a 4-man party is suggested by the Pennsylvania Society of Professional Engineers (1953). Since, however, salaries and other costs vary rather widely in different parts of the United States, it might be difficult to interpolate or extrapolate for a given community without a breakdown of the suggested fee. A fixed percentage of the value of property surveyed is another practical way of determining charges. It has the advantage of correlating pay with responsibility.

A simple but workable formula for computing surveying charges is cost plus 100 percent. This works nicely for an established office which has suitable records, or on jobs where a client does not demand a contract price. In using the fixed fee, fixed percentage, or cost plus methods, however, an analysis similar to the one described will be helpful.

The arrangement presented is an expanded and revised version of the method used by Professor Emeritus Carl B. Andrews of the University of Hawaii and brought to the writer's attention in 1936. A theoretical economist might not agree with the analysis but a check in widely separated States—California, Minnesota, and Virgina—shows that it gives results which agree with the recommended and actual rates.

❦ ❦ ❦

Aerial mapping work at Abrams Aerial Survey Corporation for the first three months of this year was up 100 percent over a similar period in 1953, according to Talbert Abrams, president of the 31-year-old Lansing, Mich., firm. As a result of the increased business, Abrams acquired additional space during the past year, has doubled the staff, and added a third photographic plane and crew.

"The backlog of orders indicates the work will continue through this year at the doubled volume," said Mr. Abrams. "There are no signs of a depression in our business. Our present problem is to get delivery on the precision equipment required, skilled technicians to operate it, and space to work in."

The Gradient Boundary

By ARTHUR A. STILES

CONSULTING ENGINEER, PURE OIL COMPANY, AUSTIN, TEX.

Foreword

This article represents a condensation by Dr. Arthur D. Kidder of the original paper which appeared in the Texas Law Review, Volume 30, 1952, under the more complete title, "The Gradient Boundary—The Line Between Texas and Oklahoma along the Red River."

In his early professional career Mr. Stiles was a topographer in the U. S. Geological Survey. In 1910 he was appointed State Reclamation Engineer for the State of Texas, where he became recognized as an authority on river hydrography and flood control. In 1923 he was appointed one of the two commissioners for the survey and marking of the boundary between the States of Texas and Oklahoma where that line follows the south bank along the course of the Red River.

The author explains the field procedure for the location of the gradient boundary at the half-way elevation between the lower level, where the river when at substantial flow just reaches and washes the designated boundary bank, and the upper level, where the river at the bank-full stage just begins to overflow into the valley flood plain.

A number of citations of cases in the Texas courts are noted in the original article, where the principle of the gradient boundary was applied in a similar manner.

—EDITOR

THE BOUNDARY LINE between the States of Texas and Oklahoma along the Red River is a portion of the boundary between the territory of the United States and the Spanish possessions established by the treaty of 1819. This portion of the line has been reaffirmed on several occasions, but never changed.

One hundred years after the treaty was agreed upon, oil was discovered on the Red River in Wichita County, Tex. Producing oil wells were completed northward across the valley and into the sand bed of the river. Land values moved skyward. The question arose with new and threatening importance: What is and where is the boundary line between Texas and Oklahoma along the Red River? Serious complications ensued and the governor of Texas dispatched the Rangers to the new oil field to preserve order.

On December 8, 1919, Oklahoma entered suit against Texas in the Supreme Court of the United States "to definitely locate and fix" the boundary between the States of Texas and Oklahoma along the Red River. The United States intervened.[1] The important events which followed are related in the official record. This case is memorable for the large monetary values involved, for the wide field covered by the scientific investigations, for the eminent counsel employed, and for the noted scientists who testified at great length. The record in the case fills nine volumes containing a total of 5,510 printed pages. Altogether, 418 witnesses testified regarding 539 miles of the Red River.

The following three expressions of the Court constitute the only original legal authority on the subject of the gradient boundary: (*a*) the opinion of the Court delivered on January 15, 1923, in which authorities are reviewed, conclusions announced, and the physical situation described; (*b*) the decree of the Court dated

[1] On the question of the ownership of the river bed, and in protection of the rights of the Kiowa and Comanche Indians, whose reservation is situated in Oklahoma along the Red River upon the side opposite the oil field.—EDITOR

March 12, 1923, giving effect to the above opinion and designating Arthur D. Kidder and Arthur A. Stiles as commissioners to run, locate, and mark upon the ground portions of the boundary in accordance with this decree and the principles announced in the opinion; and (*c*) the Report of the Boundary Commissioners, dated April 25, 1924, in which the gradient boundary is described with field notes and maps.

By order of the Court, the commissioners first determined and marked the boundary through the Big Bend area in Wichita County, Tex., where the oil wells were located with respect to the boundary. They next determined and marked the boundary through the Fort Auger area in the same county.

Under paragraph 12 (*c*) of the decree, the commissioners located and marked the boundary as thus described by the Court:

> Along all places where by avulsion since 1821 the river has come to occupy a new channel whereby fast upland theretofore on one side of the river has come to be on the other side—the line in every such instance to be run, located, and marked on and along what was the south bank before the change occurred.

Where an avulsion has occurred, the gradient boundary, upon leaving the river and passing around the old bend, ceases to be a gradient of the flowing water and becomes a boundary line on the upland. Upon returning to the river, the boundary is the gradient as before.

The first report was confirmed by the Court on June 9, 1924.

Thus the gradient boundary was finally established and fixed at the mid-height point of the lowest "acceptable" or qualified bank in the vicinity. The significant portion of the report reads as follows:

> The foregoing specifications applied in the light of the opinion admit of and require the exercise of practical judgment in determining the line intended; but certain fundamentals, such as the following, obviously must form the final basis for the exact location of the line.
>
> The boundary line is a gradient of the flowing water in the river. It is located midway between the lower level of the flowing water that just reaches the cut bank and the higher level of it that just does not overtop the cut bank. The physical top of the cut bank, being very uneven in profile, cannot be a datum for locating the boundary line; but a gradient along the bank must be used for that purpose. The highest point on this gradient must not be higher than the lowest acceptable point on this bank in that vicinity. The boundary line has been determined accordingly.

When the surface of the flowing water in the river and the elevation of the boundary coincide, the boundary is on the ground at the featheredge of the water, and stakes driven there will mark the perfect gradient and the perfect boundary—hence the name, "gradient boundary."

A realistic view of the gradient boundary can be had by walking along the bank of the river and closely observing the edge of the flowing water. Leaving the riverfront, the waterline enters the inlets; then emerging on the lower side, it veers off the high ground. Where the bank it too low, the waterline swings toward higher ground and leaves the low bank in the overflow of the river. Where the bank is too high, the waterline swings nearer the river and leaves the bank on the high ground. Where the ground is smooth, the waterline is smooth. Where the river is flowing against a steep bank, the waterline is difficult to follow. In short, the height and position of the gradient boundary are fixed by the bank of the river; the grade is fixed by the surface of the water in the river; and the course is fixed by the topography along the river.

The boundary is set at the mid-height point of the lowest qualified bank in the vicinity where the water, rising against the bank, will first overflow it. But until this bank is found, the height and position of the boundary are unknown. Therefore, finding and marking this bank conclusively locates the gradient boundary upon the ground for the first time. Thence the boundary runs on and along the bank as a gradient of the flowing water in the river. The gradient boundary does not run on the water. For one given height there is but one possible course for the boundary, since changing the height changes the course. When the height is known, the course is established in advance.

The Court has not placed the boundary at any of the various "stages" of the water in the river. The two levels of the water locating the boundary at the mid-height point of the one and only correct bank to be found in the vicinity are requirements of the Court specifying where on this bank the boundary is. The mid-height point of this bank is determined by the surveyor with his level. For this purpose it would be more convenient for him if the river were dry. This principle appears to be in full accord with the conclusions of the Court expressed in the opinion:

> We therefore are concerned with an instance in which the bank of a river, and not the river itself, has been made the boundary between two nations—now between two States of the Union.

The boundary was restricted by the Court to the lowest qualified bank. Within this restriction there is little room for material changes in the boundary; outside of it, the river is out of bounds and has no significance in determining the gradient boundary. Considering the plain description of the bank intended as the boundary bank and the qualifications placed upon it by the Court, the fundamental correctness of the gradient boundary appears obvious when the requirements of the Court are fully understood and faithfully complied with.

The boundary bank is an erosion bank here; an accretion bank there; and a transverse slope yonder. The boundary bank is determined by the relative height of the bank, not by its form, condition, or name.

Paragraph 7 of the decree reads as follows:

> At exceptional places where there is no well defined cut bank, but only a gradual incline from the sand bed of the river to the upland, the boundary is a line over such incline conforming to the mean level of the waters when at other places in that vicinity they reach and wash the cut bank without overflowing it.

The Court left no doubt about the identity of the bank intended as the boundary bank, where the boundary is on the bank, and what constitutes the bed of the river. Significantly omitting the designation "cut bank" in this instance, the Court in the opinion described these features in this unmistakable language:

> Upon the authority of these cases, and upon principle as well, we hold that the bank intended by the treaty provision is the water-washed and relatively permanent elevation or acclivity at the outer line of the river bed which separates the bed from the adjacent upland, whether valley or hill, and serves to confine the waters within the bed and to preserve the course of the river, and that the boundary intended is on and along the bank at the average or mean level attained by the waters in the periods when they reach and wash the bank without overflowing it. When we speak of the bed we include all the area which is kept practically bare of vegetation by the wash of the waters of the river from year to year in their onward course, although parts of it are left dry for months at a time; and we exclude the lateral valleys which have the characteristics of relatively fast land and usually are covered by upland grasses and vegetation, although temporarily overflowed in exceptional instances when the river is at flood.

Being described by the Court as relatively permanent and at the outer line of the river bed, the boundary bank is necessarily the low, fluvial bank. There is little in the fluvial channel of the river that is stable. The boundary bank is ever subject to changes by erosion and accretion and the gradient boundary follows the change. Where the bank is, there is the boundary also.

Preliminary work on the boundary is best done when the watercourse is dry. The whole watercourse is then visible and safely accessible on foot for close examination. The lowest qualified banks are easily found in advance. Those most favorable can be marked and numbered for future reference. Using the first flowing water as a datum plane, the lowest qualified bank can be selected and marked as the basic point.

When the flowing water is likely to continue indefinitely, the gradient boundary should be located as heretofore explained. But if the flowing water is expected to be of short duration, the boundary may be located in the following manner: If the water is conveniently at hand and flowing steadily, the surface should be accurately and speedily marked with benchmarks and guard stakes corresponding to the points to be set

on the boundary. Later, when the water is out of the way, the gradient boundary can be located with the level directly from the benchmarks. The vertical distance from the benchmarks to the boundary is obtained from the basic point.

If there is no water in the watercourse, certain watermarks of recent origin may be used in lieu of the water. When the water stops rising, flows steadily onward for a time, and then recedes, it usually leaves behind it a well defined line or trace upon the ground. This line is a gradient of the flowing water. It consists mainly of small fluvial deposits of scum, silt, sand drift, and litter which temporarily are easily recognized and followed. From these remaining watermarks, the surface of the flowing water can be recovered and marked with benchmarks and guard stakes. The gradient boundary is located with the level directly from these benchmarks, using the appropriate vertical distance obtained from the basic point as in the first instance. When the watermarks are clearly identified, the resulting position of the gradient boundary is sufficiently accurate for all ordinary purposes. River gages are not necessary in either case since the boundary is to be located directly from the benchmarks and not from the fluctuating surface of the flowing water in the river.

Stages of the flowing water materially above the top or below the bottom of the boundary bank at the basic point are not suitable for locating the gradient boundary. Flood stages for that purpose were automatically eliminated by the Court in *Oklahoma* v. *Texas*.

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Simplifying Plane Coordinate Traverse Calculations

By HENRY L. THOMSON

DEPARTMENT OF PUBLIC WORKS, CITY OF LOS ANGELES

AT CONFERENCES held for the purpose of familiarizing surveyors with the use of State plane coordinate systems, and at field demonstrations of triangulation and traverse techniques, surveyors who are contemplating the use of coordinates seem to feel that considerable complexity has been added to traverse calculations due to the sea level and scale factors.

NECESSITY OF USING CORRECTION FACTORS

When running a traverse between two fixed survey control points, is it necessary to use the sea level and scale correction factors? Will it not give as satisfactory results to use the measured distances in the computation of the coordinates and then prorate the discrepancy in closure?

An important consideration overlooked in these questions is that the neglect of the use of sea level and scale corrections masks serious errors in the traverse.

For example, a traverse starting at a fixed coordinate point and running 10,000 feet almost grid north showed a closing *Y* value on another fixed point 1.00 foot too small. The surface measurements, uncorrected for sea level and scale factors, were used in the coordinate calculations.

At first thought, second-order accuracy —1:10,000—might seem to be indicated. However, the sea level factor of 0.999928 and the scale factor of 0.999935, made a combined factor of 0.999863. This amounted to –1.37 feet correction in 10,000 feet, which further increased the *Y* coordinate closure to –2.37 feet or 1:4,200.

This discrepancy might indicate that the tape was incorrectly calibrated, or that a foot or two had been dropped, or that the taping was of such poor quality that it could only qualify as third order. No method of adjustment can correct the irregularities of third-order taping so that it will be equivalent to second-order measurement.

SIMPLIFYING CALCULATIONS FOR CORRECTIONS

If these corrections are necessary, is there not some way of combining the sea level, scale, and temperature corrections so that the calculations may be simplified?

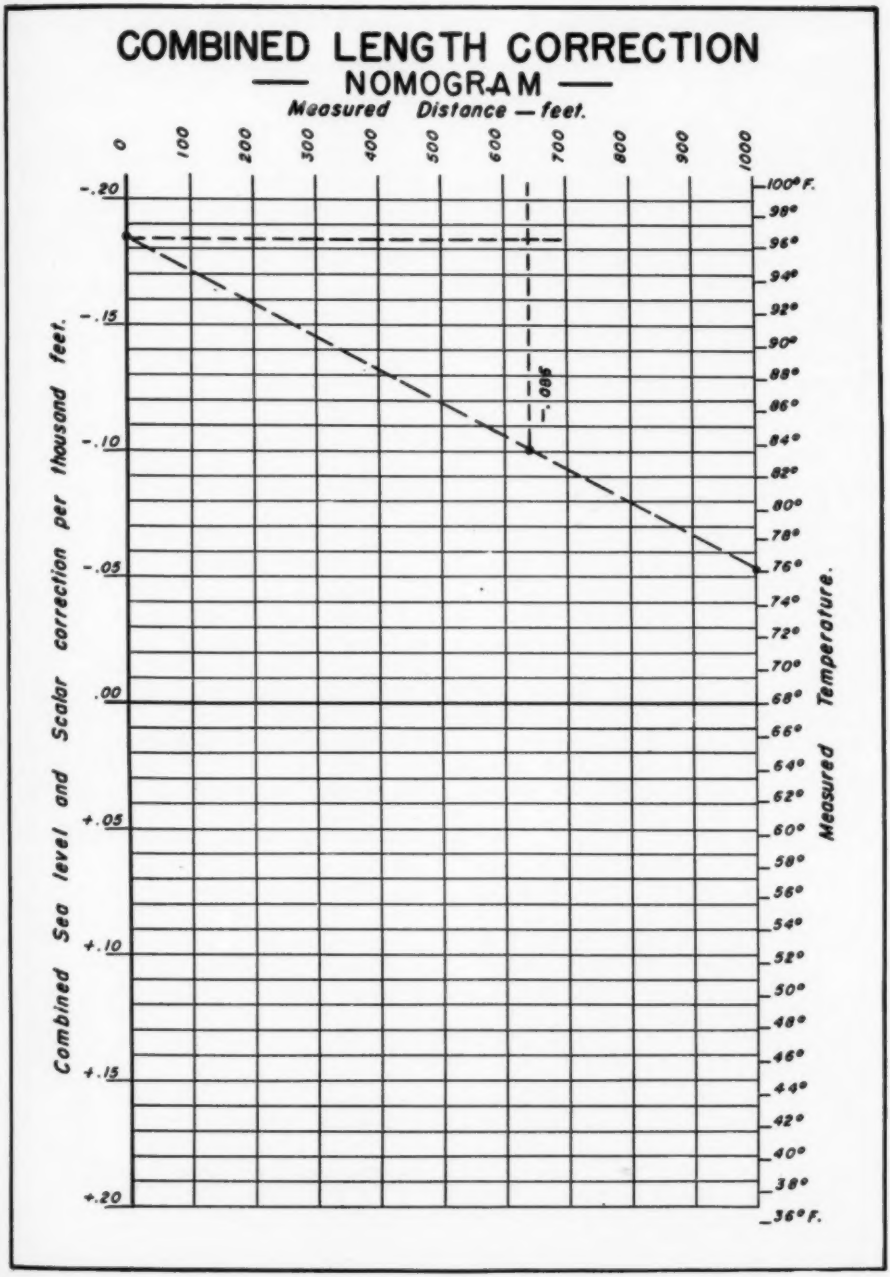
A simple nomogram will give the combined corrections quite rapidly.

Suppose, for example, that the average elevation of a small traverse is 1,000 feet. The sea level reduction factor from the tables is 0.999952 or –0.048 correction per 1,000 linear feet. The average scale factor for this area is found to be 0.999863 or –0.137 correction per 1,000 linear feet.

Adding these two corrections gives –0.185 foot correction per 1,000 linear feet of surface measurement. Let us also say the average temperature for a measured distance of 641.10 feet is 76° F.

To use the nomogram, place a straightedge on the left-hand scale at –0.185 (the combined correction for 1,000 feet) and on the right-hand (temperature) scale at 76° F. On a perpendicular line through 640 feet, measure from a point opposite the –0.185 value to the edge of the straightedge. This gives a correction of –0.085 foot. The grid length of the course, corrected for sea level, scale, and temperature will be 641.10 – 0.085 or 641.015 feet.

If the left-hand end of the straightedge is nearer the top of the nomogram, the sign of the correction will be minus. If the right-hand end of the straightedge is nearer the top, the sign of the correction will be plus. For this grid distance to be reasonably accurate it is assumed that the tape has been correctly calibrated to be 100.00 feet long at 68° F.


COMBINED LENGTH CORRECTION
NOMOGRAM
Measured Distance — feet.
0
100
200
300
400
500
600
700
800
900
1000
-.20
-.15
-.10
-.05
.00
+.05
+.10
+.15
+.20
Combined Sea level and Scalar correction per thousand feet.
.085
100° F.
98°
96°
94°
92°
90°
88°
86°
84°
82°
80°
78°
76°
74°
72°
70°
68°
66°
64°
62°
60°
58°
56°
54°
52°
50°
48°
46°
44°
42°
40°
38°
36° F.
Measured Temperature.

Systematizing Tacheometric Reductions

By B. GOUSSINSKY

SURVEY OF ISRAEL

THE PROBLEM of computing horizontal distances and differences of height from tacheometric observations has given rise to a number of auxiliary devices such as tables of various kinds, special slide rules, and nomograms. Automatic reduction in the field by a self-reducing instrument is, of course, the most important of the improvements. This procedure possesses drawbacks, however, which occasionally cause one to revert to the ordinary way of observing the angle and the stadia intercept in the field and then carrying out the reduction in the office. The method described here is an office procedure which I introduced during recent years under the pressure of rapidly advancing development work.

The new procedure entails the combined use of a small calculating machine and a brief table pasted on cardboard. The table covers only a limited range (usual slopes); if greater angles are required the continuation of the table can be pasted on the reverse side of the cardboard. A specimen portion of such a table is illustrated.

The operator places before him, conveniently arranged, the field book, the calculating machine, and the tacheometric table pasted on cardboard. The intercept from the field book is entered on the machine and multiplied consecutively by the appropriate tabular values in the columns *H* and *V*,

5°			6°			7°	
′	H	V	′	H	V	′	
0	.9924	.0868	0	.9891	.1040	0	
2	.9923	.0874	2	.9890	.1045	2	
4	.9922	.0880	4	.9888	.1051	4	
6	.9921	.0885	6	.9887	.1057	6	
8	.9920	.0891	8	.9886	.1062	8	
10	.9919	.0897	10	.9885	.1068	10	
12	.9918	.0903	12	.9883	.1074	12	

TACHEOMETRIC TABLE

representing the horizontal distance and the vertical interval, respectively, for a unit of intercept. The tabular values are obtained directly, *without interpolation, without any page turning, and without touching the table.*

The method has proved to be less fatiguing for the computer, and certainly not less economical than other methods of reduction.

Discussion

By C. S. MALTBY

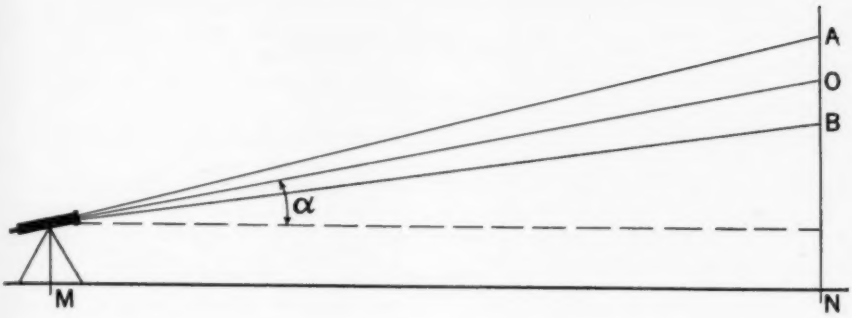
U. S. GEOLOGICAL SURVEY

EUROPEAN development in planetable survey equipment has been confined to stadia and vertical angles and to automatic reduction tacheometric instruments. Americans have used the former widely, but have seldom used the tacheometric type of instrument. Instead, alidades equipped with the Beaman arc, developed by the Geological Survey, are universally used with planetables. (*See* "Alidade Development in the Geological Survey," in this issue. —Ed.)

The table illustrated by Mr. Goussinsky is based on the following formulas (*see* figure):

$$H = \text{Distance } MN = \frac{F}{i} AB \cos^2 \alpha + (F + c) \cos\alpha$$

$$V = \text{Height } NO = \frac{F}{i} AB \tfrac{1}{2} \sin 2\alpha + (F + c) \sin\alpha$$



where

F = Focal length of telescope

i = Fixed interval between the hairs

c = Distance from the center of instrument to center of objective lens.

Complete tables, correct for instruments with internal focus and with $\frac{F}{i} = 100$, are available in standard engineering texts.[1]

[1] DAVIS AND FOOTE, Surveying Theory and Practice, Fourth edition, pp. 881–888.

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By THEODORE WILD

PETROLEUM GEOLOGIST AND NATURAL GAS ENGINEER, FEDERAL POWER COMMISSION

THE POLAR PLANIMETER is one of the most widely used technical instruments. Geologists, engineers, surveyors, contractors, estimators, and a host of other technical people use it frequently for the measurement of areas and volumes.

The presently practiced method of using the instrument is tedious, time-consuming, and subject to errors. To obviate these shortcomings, the method described in this paper has been evolved. This method reduces the operating time considerably. Simple elementary geometry has been used in the development of the formula. This method has the further advantage of requiring fewer readings and fewer manipulations and therefore offers fewer chances of error.

GENERAL RULES

In using the polar planimeter, the same direction of motion (clockwise or counterclockwise) must be followed throughout the work.

The surface on which the wheels of the instrument move should have a uniform texture.

The angle between the arms of the instrument should remain within a range of 50 to 130 degrees.

Before using the planimeter, the instrument should first be calibrated with reference to the scale of the particular work at hand.

The calibration of the instrument should preferably be done near the center of the area which is to be planimetered.

CALIBRATION OF THE POLAR PLANIMETER

The object of calibrating the instrument is to determine *area per unit vernier* of the particular map or drawing, the planimetering of which is contemplated.

As suggested, a suitable known area, depending on the map scale, should be chosen for the calibration. The first reading, at the starting point, is recorded. Then the instrument is put in motion to follow the boundary of the selected area, and the second reading is recorded when the pointer has returned to the starting point. Let the second reading minus first reading equal x_1 units.

This process should be repeated at least four times. Then the arithmetic average of x_1, x_2, x_3, and x_4 should be determined. Let us assume that this average is x_a. If, for example, a unit of 640 acres was chosen for the purpose of calibration, the *area per unit vernier* will be $\frac{640}{x_a}$ acres.

METHOD OF USING THE POLAR PLANIMETER

Let figure 1 represent the cross section, and figure 2 be the contour map of the mass whose volume is sought. The mass might be a coal or ore pile, a sand lens, or an earth stratum.

First, a straight line A_0A_5, traversing all the contours is drawn. The pointer of the instrument is poised on A_0 and the first reading Y_1 is taken. The instrument is then put in operation following the zero contour until the pointer returns to the starting point A_0, and the second reading Y_2 is recorded. Then the pointer is moved from A_0 to A_1, along the line A_0A_5, and the next contour is followed, going over the contour *twice*. Again the pointer is moved from A_1 to A_2, along the line A_0A_5, and the next contour is traced *twice*. Similar steps are continued until the last contour is reached.

On the last contour, if the top of the mass is flat and coincides with the last contour, that contour should be traced only *once*. If the top of the mass reaches the elevation

of another contour, as in the illustration, then the last contour should be traced *twice*. But if the top of the mass is somewhere between the two heights, the pointer

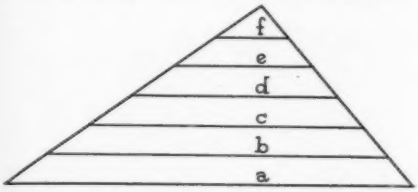

FIGURE 1.—Cross section of the mass whose volume is sought.

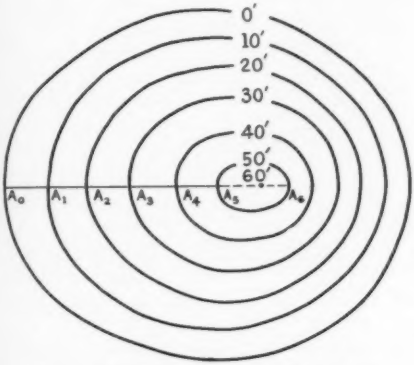

FIGURE 2.—Contour map of the mass.

is moved along the last contour *once plus the appropriate fraction of a contour interval*. For example, if in the illustration the top of the mass reached the height of 56 feet, then the pointer would have to trace the 50-foot contour once plus six-tenths of the 50-foot contour, to a point, say A_6, and return along the line A_6A_5, to A_5.

When the planimetering is thus finished, the instrument is brought back, along the line A_0A_5, from A_5 to A_0 (its first position) and the third reading Y_3 is recorded. The formulas are as follows:

$$Y_2 - Y_1 \times \textit{area per unit vernier} = \textit{Area}$$

$$\frac{Y_3 - Y_1}{2} \times \textit{area per unit vernier} \times \textit{contour interval} = \textit{Volume}$$

If the area per unit vernier is in acres and the contour intervals are in feet, then the area will be in acres and the volume will be in acre-feet.

Although in the illustration the mass is rather regular, the above method has proven to be satisfactory, to within 2 percent, for irregular masses such as faulted or truncated structures.

DERIVATION OF THE FORMULA

Figure 3 shows individual slices of the mass one contour interval in depth. The

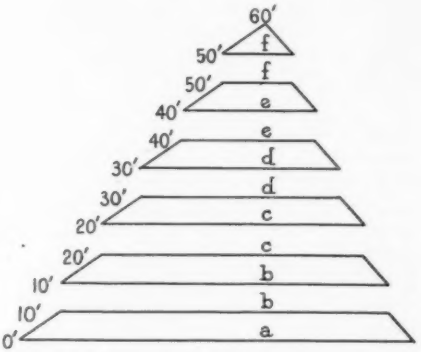

FIGURE 3.—Cross section of successive slices of the mass one contour interval in thickness.

volume of each one of these slices is expressed thus:

$$V = \left(\frac{a+b}{2}\right) h$$

where a and b are the areas of the two parallel bases and h is the vertical interval between the two parallel bases.

Therefore, the volumes of all the individual slices in figure 3 are as follows:

$$0\text{–}10 \text{ feet} = \left(\frac{a+b}{2}\right) (\textit{contour interval})$$

$$10\text{–}20 \text{ feet} = \left(\frac{b+c}{2}\right) (\textit{contour interval})$$

$$20\text{–}30 \text{ feet} = \left(\frac{c+d}{2}\right) (\textit{contour interval})$$

$$30\text{–}40 \text{ feet} = \left(\frac{d+e}{2}\right) (\textit{contour interval})$$

$$40\text{–}50 \text{ feet} = \left(\frac{e+f}{2}\right) (\textit{contour interval})$$

$$50\text{–}60 \text{ feet} = \left(\frac{f}{2}\right) (\textit{contour interval})$$

Hence the volume of the whole mass is expressed as follows:

$$\textit{Volume} = \left(\frac{a+2b+2c+2d+2e+2f}{2}\right) (\textit{contour interval}).$$

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Scientific Jargon and the Dissemination of Knowledge

INCREASING specialization of knowledge has inevitably sharpened the appetite for economy of expression, with the result that the technical language of specialists in one branch of science is as unintelligible to specialists in other branches as Ogham would be to a Patagonian. What, for example, is the botanist likely to gather from such physical terms as *gamma-decay, anti-neutrino, kicksorter,* and (incredibly) *cutie pie?* Or the physicist from the botanist's *homoiochlamydeous, monochasium, strophiole,* and *suffruticose?* Or either of them from the chemist's *chelation, heteropolyacids, interstitial hydrides,* and *glucopyranosido-fructofuranoside?* Physicists, botanists, and chemists are of course no more prone to jargon than workers in other fields of science, and it is true that all these arcane scientific dialects serve the very useful purpose of enabling information to be exchanged quickly, briefly, and accurately between those who are familiar with them.

At the same time, and even though modern scientific language is certainly not intended to keep knowledge secret, it is very regrettable that ideas which in themselves would probably be perfectly intelligible to the average scientist, of every persuasion, should be so expressed as to give no clue to their character. Specialization in science works in two ways, which appear at first sight to be diametrically opposed. In the first place, the specialist tends to concentrate on a narrow topic, and is inclined to neglect what goes on outside his own particular field, but, in the second place, it happens more and more frequently that discoveries in one branch of science prove to have great significance for others. There is therefore an urgent need, not for less specialization, but for the ready dissemination of knowledge from each scientific study to all the others. Here, jargon is the great barrier. How great it is, editors of such journals as *Endeavour* probably realize better than most. It has often been—indeed, regularly is—our experience that an article written by an acknowledged authority on his subject, and pellucidly clear to his fellow-workers, may be so much gibberish to equally accomplished scientists of other interests. This unfortunate circumstance is not wholly unavoidable. However important it may be that workers in the same field should be able to save time by using a cryptic argot among themselves, it is at least as important that they should also give an intelligible account of their work to scientists in general. It need not always be a detailed account, but it should be clear and accurate enough to enable workers in other branches to estimate whether it describes results which might have a bearing upon their own investigations. In any case, scientists possess as much curiosity as other men, and share their weakness for wanting to know what is going on over the garden wall. If specialization (as we have been told so many times that we are weary of it) is knowing more and more about less and less, it should not necessarily entail the penalty of having to know less and less about more and more.

Reprinted by permission from an editorial in the British scientific journal, *Endeavour,* January, 1953.

National Geographic Changes Officers

THE National Geographic Society on May 5, 1954, announced the retirement of Dr. Gilbert Grosvenor as president of the Society and editor of its magazine, and the election of

(Courtesy National Geographic Society)
DR. GILBERT GROSVENOR

Dr. John O. La Gorce to these positions. Dr. La Gorce was nominated by the man he succeeds.

Dr. Grosvenor is respected the world over by geographers, naturalists, mappers, and other scientists in related fields, as well as by the public to whom the *National Geographic Magazine* is a distinguished medium of education and a constructive force in the progress of civilization.

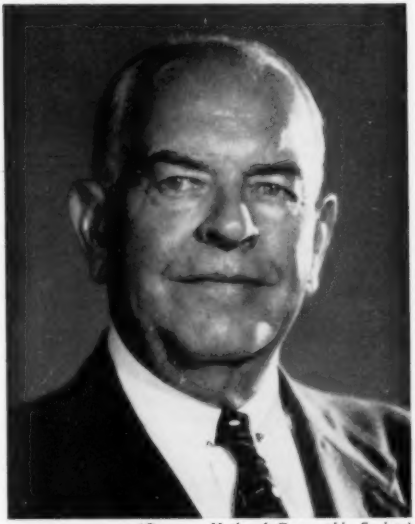
Dr. Grosvenor's retirement came after more than 55 years of service to the Society, the last 34 as its president. His resignation was accepted only on condition that he become chairman of the board of trustees.

In retiring, Dr. Grosvenor reviewed for the members of the board of trustees the progress of the Society and its magazine from the early days when he could carry an entire edition of the magazine on his back to the post office in one trip, to its present position of leadership. He has seen the Society grow to more than 2 million members in every country of the world.

A resolution, offered by General of the Army George C. Marshall and unanimously adopted by the board, expressed admiration, gratitude, and appreciation to the man who "as the principal architect and master builder of the National Geographic Society and its magazine, has been an inspiring example to us who have been privileged to serve with him." The resolution described Dr. Grosvenor as editor, educator, world traveler, scientist, writer, business executive, and financier by vocation, and ornithologist, naturalist, and photographer by avocation.

Dr. Grosvenor was presented an Honorary Citation Certificate by the ACSM at the Tenth Annual Meeting in June 1950 "for outstanding professional services rendered, without remuneration, to the American Congress on Surveying and Mapping, thereby advancing the aims and purposes of the profession and promoting the public welfare." This citation was, at least in part, in recognition of his efforts, through the Society, in sponsoring formation of ACSM.

Dr. La Gorce joined the Society's staff at the invitation of Dr. Grosvenor in 1905 and has served the Society continuously since, first as assistant secretary of the Society, later as assistant editor of the magazine and since 1911 as associate editor. He was elected vice president



(Courtesy National Geographic Society)
DR. JOHN OLIVER LA GORCE

of the Society in 1920 and is a life trustee of the organization. He has traveled widely and is the editor and author of many books and articles on geographical and natural history subjects.

Surveying and Mapping News

Members are requested to send in surveying and mapping news items for publication in SURVEYING AND MAPPING.—EDITOR.

CURRENT SURVEYING AND MAPPING LITERATURE

MAGAZINE ARTICLES

General Interest

EUROPEAN ORGANIZATION FOR EXPERIMENTAL PHOTOGRAMMETRIC RESEARCH. W. Schermerhorn. *Photogrammetria*, Vol. 9, No. 4, 1952–1953. (Discussion of the structure and aims of the organization and a copy of the agreement pertaining to its formation.)

PRESIDENTIAL ADDRESS, SYDNEY DIVISION, INSTITUTION OF SURVEYORS, AUSTRALIA. A. J. Lines. *The Australian Surveyor*, Vol. 14, No. 5, March 1953. (Review of the past year which marked the first year of the operation of the Institution of Surveyors, Australia, on a Commonwealth basis.)

THIRTEENTH ANNUAL MEETING AND EXHIBIT OF THE AMERICAN CONGRESS ON SURVEYING AND MAPPING, Washington, D. C., March 1953. J. Vance Dobbin (Chairman, Annual Meeting Publicity Committee, ACSM.) *Bulletin Geodesique*, New Series, No. 28, June 1953.

TOUGH SURVEY. J. H. Creed. *California Highways and Public Works*, Vol. 32, Nos. 9–10, September–October 1953. (Informal account of difficulties in surveying through thick growth and swamp areas for realignment of portion of old Bridgeport road in Mono County, Calif.)

DEVELOPMENT OF YADKIN RIVER BASIN. Brig. Gen. Charles G. Holle, Division Engineer, South Atlantic Division, C. of E., *North Carolina Engineer*, Vol. 10, No. 1, October, 1953. (Presented at the summer convention, North Carolina Society of Engineers, Asheville, July 30–31, Aug. 1.)

THEY KEEP YOU POSTED ON ROCKS AND SHOALS. Pete Noyes. *All Hands*, (The Bureau of Navy Personnel Information Bulletin). No. 441, November 1953. (Brief review of the work of the Navy Hydrographic Office, its history, and the establishment of a branch office at Yokohama.)

CENTER VS. CENTRE. H. F. Raup. *Names*, Vol. 1, No. 4, December 1953. (Discusses variations in the spelling of the place name prefix "center" appearing on maps over a long period of years.)

THE PROBLEM OF A NATIONAL GAZETTEER. Lewis Heck. *Names*, Vol. 1, No. 4, December 1953. (Estimates that the long-discussed project for a national gazetteer would involve the listing of approximately 1,000,000 United States place names.)

W. L. G. JOERG, 1885–1952. Herman R. Friis. *Annals of the Association of American Geographers*, Vol. 43, No. 4, December 1953. (An annotated biographical study of the late distinguished geographer, map authority, and Chief of the Cartographic Records Branch of the National Archives, accompanied by a bibliography of his published works, papers, and works for which he was editorially responsible.)

RESHAPING PUBLIC LAND POLICY. Orme Lewis. *Our Public Lands*, Vol. 4, No. 1, January 1954. (Discussion of six major goals in the reorganization of public lands administration.)

PETROLEUM IN CALIFORNIA. (Staff production.) *Mineral Information Service*, Vol. 7, No. 1, January 1, 1954. (It should be noted that the *Mineral Information Service* frequently includes information other than the lead title suggests. Current mapping in California is an example. This publication, which may be of interest to many members of ACSM, is distributed without cost on request to the Department of Natural Resources, Division of Mines, Ferry Building, San Francisco 11, Calif.)

CONFEDERATE MAP SUPPLY. James L. Nichols. *The Military Engineer*, Vol. 46, No. 309, January–February 1954. (Historical account of Confederate mapping including the many difficulties encountered from the beginning and how, ultimately, the problem was solved by photography.)

Cartography

MAPS OF THE PHILIPPINE ISLANDS. Capt. Earle A. Deily, USC&GS, *The Journal of the Coast and Geodetic Survey*, No. 5, June 1953.

(Historical account of mapping in the Philippine Islands from earliest times to the present; illustrated with a number of facsimilies of historical maps.)

A NEW AERONAUTICAL PLOTTING CHART. T. Freer. *The Journal of the Institute of Navigation,* Vol. 6. No. 4, October 1953. (Describes design of new type plotting chart to assist navigators of high-speed aircraft.)

LOOKING TO THE FUTURE IN PHOTOGRAMMETRY. John V. Sharp. *The Canadian Surveyor,* Vol. 11, No. 6, October 1953. (Discussion of limitation in all components of the photogrammetric method and of general progress made in the field.)

AN AVERAGE SLOPE MAP OF KANSAS. Wesley Calef and Robert Newcomb. *Annals of the Association of American Geographers,* Vol. 43, No. 4, December 1953. (Discussion of method in the little-developed practice of applying statistical methods to terrain description.)

THE RELIABILITY FACTOR IN THE DRAWING OF ISARITHMS. David I. Blumenstock. *Annals of the Association of American Geographers,* Vol. 43, No. 4, December 1953. (A study of method, with illustrations of the various effects, in compiling an isarithmic map of mean July temperatures in the State of Kansas.)

THE LANGUAGE OF MAPS. J. M. Blaut. *The Professional Geographer,* Vol. 6, No. 1, January 1954. (Points out some of the serious limitations of cartographic presentation but does not minimize the importance of maps to the science of geography.)

THE DOT PLANIMETER, A NEW WAY TO MEASURE MAP AREA. Walter F. Wood. *The Professional Geographer,* Vol. 6, No. 1, January 1954. (Suggests a device for measuring map area "which will overcome both the mechanically originated shortcomings of the mechanical planimeter and the psychological ones of the square counting method.")

BULKY BLUEPRINTS GO MODERN WITH CHANGE TO MULTILITH. Anonymous, submitted by Portsmouth Naval Shipyard. *Bureau of Ships Journal,* Vol. 2, No. 10, February 1954. (Describes economy of space effected by making use of multilith reproductions.)

Control Surveys

BAROMETRIC LEVELLING. Maj. H. F. Eggeling. *The Australian Surveyor,* Vol. 14, No. 5, March 1953. (Describes methods of using aneroid barometers in operation in Snowy Mountains Hydro-Electric Authority to obtain vertical control of air photography with a minimum of cost and in a minimum of time.)

THE ECONOMY OF THE CONTROLLED SURVEY. Hugh C. Mitchell, *The Military Engineer,* Vol. 46, No. 309, January–February 1954. (Discusses the value of controlled surveys when based on the national triangulation net and suggests the desirability of establishing State offices of surveys and maps.)

AERIAL RECONNAISSANCE FOR TRIANGULATION IN THE TROPICS. W. F. Cothern, Inter-American Geodetic Survey. *The Journal of the Coast and Geodetic Survey,* No. 5, June 1953. (How reconnaissance by aircraft, and especially helicopters, helps overcome the difficulties of negotiating jungle and difficult terrain.)

PRELIMINARY ADJUSTMENT OF SHORAN AND EPI OBSERVATIONS IN THE BERING SEA. Buford K. Meade, USC&GS. *The Journal of the Coast and Geodetic Survey,* No. 5, June 1953. (This, a companion article to the one by Captain Pierce cited below, tells briefly of the mathematical work done and includes tables showing corrections of measured lengths, measurements compared with computed lengths of different methods, and mean lengths and corrections.)

DATUM CONNECTION TO THE BERING SEA ISLANDS. Capt. Charles Pierce, USC&GS. *The Journal of the Coast and Geodetic Survey,* No. 5, June 1953. (Employment of the Electronic Position Indicator to overcome difficult conditions of weather and distance in establishing long lines of triangulation to close an important gap in the Alaska-Bering Sea scheme.)

A SIMPLIFIED ANALYTICAL METHOD FOR THE ADJUSTMENT OF AERIAL TRIANGULATION. R. J. Owen. *New Zealand Surveyor,* Vol. 20, No. 10, August 1953. (Describes method used in connection with Wild A5 and A6 stereo-plotting machines.)

PRECISE LEVELLING IN NEW ZEALAND. A. Reid. *New Zealand Surveyor,* Vol. 20, No. 10, August 1953. (Largely a discussion of specifications, methods, and procedures.)

SHORAN OPERATIONS IN CANADA. *The Canadian Surveyor,* Vol. 11, No. 6, October 1953. Part I, SHORAN SURVEY OPERATIONAL ORGANIZATION, F/O R. A. Saunders, R.C.A.F.; Part II, SHORAN GEODETIC OPERATIONS, W. J. MacLean, Geodetic Survey of Canada.

A PROPOSED TECHNIQUE FOR REDUCTION OF SHORAN DATA TO GEODETIC DISTANCES. Warren L. Godson. *Transactions of the American Geophysical Union,* Vol. 34, No. 5, October 1953. (Develops formulas adapted to the rapid slide-rule computation of the difference, geodetic distance minus shoran measurement.)

Education

AN IMPROVED CURRICULUM FOR

CARTOGRAPHIC TRAINING AT THE COLLEGE AND UNIVERSITY LEVEL. George F. Jenks. *Annals of the Association of American Geographers,* Vol. 43, No. 4, December 1953. (Results of an analysis of the deficiencies and needs of cartographic education based on a year of extensive study and many interviews with employers of cartographers and educators. A subject matter check list of cartography for use in planning curricula is added.)

Topography

USE OF THE HELICOPTER FOR TOPOGRAPHICAL MAPPING SURVEYS. P. C. Atkinson. *The Canadian Surveyor,* Vol. 11, No. 6, October 1953. (An account of operations in the more inaccessible areas of Canada.)

Instruments

UN NOVEAU STEREOSCOPE D'INTERPRETATION, LE O. D. S. S. R. Roelofs. *Photogrammetria,* Vol. 9, No. 4, 1952–1953. (Description of the construction and use of the "Old Delft Scanning Stereoscope" produced by the Old Delft Company, Delft, Holland.)

WHO INVENTED THE SEXTANT? A. Cecil Hampshire. *Nautical Magazine,* Vol. 170, No. 5. November 1953. (A summary of the 18th century controversy over the claims of Hadley, the Englishman, and Godfrey, the American.)

A NEW GEODETIC LEVEL ROD. Douglas L. Parkhurst, USC&GS. *The Journal of the Coast and Geodetic Survey,* No. 5, June 1953. (Describes an improved level rod and new methods of its construction, marking, and calibration.)

THE WILD T-O AS A MAGNETIC INSTRUMENT. Comdr. Edward B. Brown, USC&GS. *The Journal of the Coast and Geodetic Survey,* No. 5, June 1953. (Describes experiments with use of the instrument as an improvised compass during the work of the Inter-American Geodetic Survey.)

SOME REQUIREMENTS FOR AERIAL SURVEY CAMERAS. P. D. Carman. *The Canadian Surveyor,* Vol. 11, No. 6, October 1953. (Points out that errors from aerial survey cameras and from unsuitable conditions of their use cause waste and inaccuracy in the preparation of maps and discusses how the sources of these errors can best be reduced by the proper construction and use of the camera and its auxiliary equipment.)

GESCHICHTLICHES VOM MAGNETKOMPASS. W. Schleif. *Der Seewart* (Nautische Zeitschrift fur die Deutsche Seeschiffahrt, Hamburg), Band 14, Heft 6, December 1953. (Historical notes on early German compass makers.)

NAVAL COMPASSES IN 1707. Comdr. W. E. May. *The Journal of the Institute of Navigation,* Vol. 6, No. 4, October 1953. (Describes a contemporary study of the defects and merits of various compasses in use at the time.)

JEAN ROTZ AND THE VARIATION OF THE COMPASS, 1542. E. G. R. Taylor. *The Journal of the Institute of Navigation,* Vol. 7, No. 1, January 1954. (Early investigations of a troublesome phenomenon.)

Property Surveys

THE EXPANDING SURVEY FIELD: IMPRESSIONS AND SUGGESTIONS. G. C. Irving. *The Australian Surveyor,* Vol. 14, No. 5, March 1953. (Talk given before Brisbane Division, ISA, devoted largely to improved standards and expanded opportunities for licensed land surveyors.)

ETUDE SUR LE STATUT DU GEOMETRE DANS LES DIFFERENTS PAYS: TITRE TROISEME, PARTIE III: L'AMERIQUE. CHAPITRE I: L'ARPENTEUR-GEOMETRE AU CANADA. (Study on the Status of Surveying in Different Countries: Section Three, Part III: America. Chapter I: The Land Surveyor in Canada.) Paul Terlinck. *Le Geometre-Expert & Geometre Architecte Independant* (Belgium), No. 43, September–October, 1953. (Entire issue devoted to the legal and social position, education, work, and associations of Canadian surveyors.)

. THE GRANTING OF LANDS AND SURVEYING PROBLEMS IN NOVA SCOTIA. Reginald E. Dickie. *The Canadian Surveyor,* Vol. 11, No. 6, October 1953. (Historical account of early land surveying in Nova Scotia with interesting commentaries on the degree of reliability of various well-known old-time surveyors.)

A REALISTIC LOOK AT SMALL TRACTS. Karl S. Landstrom. *Our Public Lands,* Vol. 4. No. 1, January 1954. (Cites the large public demand for small tracts of public land and gives a brief résumé of what is actually available.)

SPEEDY SERVICE ON PATENTS. James A. Barr. *Our Public Lands,* Vol. 4, No. 1, January 1954. (Describes steps taken to expedite the issuance of land and mineral patents.)

BOOKS AND PAMPHLETS

MAPS AND DIAGRAMS: THEIR COMPILATION AND CONSTRUCTION. Francis John Monkhouse. London, *Methuen & Co., Ltd.,* 1952. 330 pp.

SURVEY DEPARTMENT REPORT FOR THE FINANCIAL YEAR 1952–53. Survey Department, Kingston, Jamaica. 10 pp., diagrams.

A SELECTED BIBLIOGRAPHY OF SOUTHERN CALIFORNIA MAPS. Edward L. Chapin, Jr. Berkeley, *University of California Press,* 1953. 142 pp., map.

MOTORING TO MEXICO. Travel Division, Pan American Union. Washington, D. C., 14th edition revised, October 1953, 54 pp., 25 cents. (Compilation of information on highways and facilities for the motorist with highway strip maps accompanied by terrain profiles.)

SIMPLIFIED DRAFTING PRACTICE: A MODERN APPROACH TO INDUSTRIAL DRAFTING. William L. Healy. New York, *John Wiley & Sons, Inc.* 1953. 156 pp.

A MANUAL ON THE AIRPHOTO INTERPRETATION OF SOILS AND ROCKS FOR ENGINEERING PURPOSES. Purdue University. Joint Highway Research Project. Lafayette, Ind., 1953. 206 pp.

MAP INTELLIGENCE. U. S. Army Map Service. (AMS Training Aid No. 6) Washington, 1953. 417 pp.

SURVEY OF KENYA ADMINISTRATION REPORT 1952. Colony and Protectorate of Kenya, Nairobi, 1953. 17 pp. tables, 3 progress maps.

MAPS AND THEIR MAKERS, AN INTRODUCTION TO THE HISTORY OF CARTOGRAPHY. Gerald Roe Crone. London, *Hutchinson's Universal Library,* 1953. 181 pp.

THE GEOGRAPHICAL INTERPRETATION OF TOPOGRAPHIC MAPS. London, *George Harrap and Co., Ltd.* 1953. 309 pp.

A HISTORY OF CIVIL ENGINEERING: AN OUTLINE FROM ANCIENT TO MODERN TIMES. Hans Straub; English translation by E. Rockwell. *Leonard Hill, Ltd.,* London. (1953). 258 pp. (First published in German in Basel, 1949.)

THE ART OF HAND LETTERING. Helen Wotskow. *Watson-Guptil Publications,* New York 18, N. Y. 320 pp., $6.00.

MAPS AND MAP MAKERS. R. V. Tooley. *Crown Publishers,* New York. Revised edition, 104 maps, $7.50.

—LYMAN D. LYNN

DISTINCTIVE RECENT MAPS

For the reader's convenience, the addresses of publishers and prices of maps are given where this information is available.—EDITOR

The Americas (1 : 12,500,000) is the title of a new physical-political map of North and South America prepared by the American Geographical Society of New York and printed in 1953 by A. Hoen & Co., Inc., Baltimore. The map is based upon the Society's 107-sheet Millionth Map of Hispanic America, and its Map of the Americas (1 : 5,000,000), as well as aerial photographs and recent findings of explorers, missionaries, and scientists. The bipolar oblique conic projection, devised by O. M. Miller and William Briesemeister of the A. G. S. Staff, reduces to a minimum distortion of the land masses. Physical features, political boundaries, cities and towns, roads, railroads, and airports are shown on this 10-color map. "Cities and transport," agricultural land use," "moisture regions," and "natural vegetation" are the subjects of four small inset maps. The map of *The Americas,* which measures 51 by 34 inches, may be ordered from the Society (Broadway at 156th Street, New York City) at $2.50 (folded), $3.00 (rolled), or $3.50 (waterproof latex paper). Fellows of the A. G. S. may deduct 25 percent from the above prices.

American Indian Tribal Areas is the title of a small pictorial map copyrighted in 1953 by Garner Parker Dicus of Puente, Calif. It shows "the different cultural areas of the American Indian," as well as the eight major language groups. The map is decorated with drawings of various Indian types, dwellings, activities, and symbols. It measures approximately 12 by 17 inches. No scale is given.

The Missouri Division of Resources and Development issued in 1953 a series of maps presenting various aspects of the resources, population, and economic activities of the State. *Population Trends by Counties, 1890 to 1950,* presents a population curve for each county, highlighting with red overprinting those counties which had a smaller population in 1950 than in 1890. This map, smaller than the others in the series, is at the approximate scale of 1 : 1,300,000 and measures 16½ by 20½ inches.

The scale of the five other maps is 1 : 750,000 with dimensions of 27 by 31 inches. They feature the following information:

Population of Cities and Towns is shown on a map outlining county boundaries and identifying county seats.

Electric Transmission Lines, January 1, 1951, shows also power plants and substations. Communities served from "system owned by transmission company," "system owned by municipality," and "from locally owned private distribution system" are identified with different symbols.

Water Resources gives "ground water characteristics" for different parts of the State as well as "minimum stream flow in gallons per day" of surface waters.

Railroad Junction Map, April 1, 1953, "shows all railroads and all junction points at which there are track connections for interchange of carload freight," as well as mileage between junction points.

Gas and Oil Pipe Lines, January 1, 1951, traces existing and proposed lines as well as identifying cities served by natural gas or artificial gas.

A map locating the *Oil and Gas Fields of Ohio,* at the scale of 1 inch to 6 miles, was published in 1953 by the Division of Geological Survey of the [Ohio] Department of Natural Resources. Gas pools are marked in red and oil pools in green. Each pool is identified with a number on the map, and the numbers are keyed to names on a list of all pools. The list also gives the year of discovery, the producing sand, and the average depth of the pool. The map was compiled by Robert L. Alkire from data received through the cooperation of several oil and gas companies operating within Ohio. Measurements of the map are 52 by 39½ inches.

Wyoming Oil and Gas Map is published by Hotchkiss Mapping Co., 4055 Fox St., Denver 16, Colo. It shows the major structural basins of the State, oil fields, gas fields, oil and gas fields, oil and natural gas pipelines, dry and abandoned oil and gas wells, roads and railroads, and towns and cities. A table locates pools by counties and latitude and longitude, identifies them as oil or gas producers, and names the producing horizon for each. The map scale is 1 : 1,000,000 and the dimensions of the sheet are approximately 22 by 24 inches.

A new planning *Map of the City of New York* was compiled in the [New York City] Department of City Planning, September 1952. All five boroughs of the city are embraced by the map which is at the scale of 1 inch to 2,000 feet. It is printed on four sheets each of which measures 41 by 20½ inches. Existing and proposed parks and parkways, public housing, title 1 housing, private housing, incinerators, sewage disposal plants, expressways, and rapid transit lines are shown.

Louisville and Vicinity is one of the more recent of the urban area maps prepared by the U. S. Geological Survey in cooperation with various city, county, and State agencies. Printed at the scale of 1 : 24,000, the map shows the street pattern of Louisville and its suburban areas, as well as for the smaller urban centers of New Albany and Jeffersonville, Ind., on the north bank of the Ohio River. Showing as they do many recognizable cultural features, as well as the topography of the land, these urban area maps are helpful aids in teaching urban and cultural geography, and extremely valuable to city planners and real estate developers. The *Louisville and Vicinity* map, which measures approximately 42 by 38 inches, may be ordered from the U. S. Geological Survey, Washington 25, D. C., the Indiana Department of Conservation, Indianapolis, and the Kentucky Agricultural and Industrial Development Board, Frankfort, Ky.

The Geological Survey of Canada [Department of Mines and Technical Surveys] published in 1953 a map entitled *Southwestern Ontario Principal Oil and Natural Gas Fields.* In addition to delimiting the fields, it shows natural gas pipelines, compressor stations, main highways, county and township boundaries. The map was prepared by B. V. Sanford and A. Larochelle, with cartography by the Geological Cartography Division. There are eight enlarged inset maps of the major fields. The map measures 27½ by 38 inches and is at the scale of 1 : 380,160.

The map supplement to the March 1954 issue of the National Geographic Magazine is entitled *West Indies,* but it includes in addition to these islands most of the Caribbean Sea, southern Florida, northern South America, and parts of Central America. Measuring 37½ by 29 inches, the map is at the scale of 1 : 3,500,000. Bordering the main map are thirty large-scale insets of major islands, island groups, and cities. In addition to presenting the standard physical and cultural data for the land areas, the *West Indies* map gives some 1,700 soundings in the water areas, as well as ocean currents, prevailing winds, and depth contours.

International railroad freight lines of western Europe are featured on a map entitled *Internationale Güterverkehrskarte* compiled by the German Federal Railways and published, in 1953, by the Bundesbahndirektion, Wuppertal, Germany. Main lines, secondary lines, and ferry boat lines are differentiated, and stations and seats of railway directions are located. The map is at the scale of 1 : 3,500,000 and measures approximately 31 by 41 inches. The Scandinavian countries and the Saar district are shown on inset maps. Legends are given in German, English, French, and Italian.

The navigable waterways of France and their connections with the water routes in Belgium, Holland, and Germany are presented on *Carte des Voies Navigables Françaises en Liaison avec les Canaux Belges, Hollandais et Allemands.* It was published in 1951, at the scale of 1 : 800,000, by L'Union Fedéral des Chambres Syndicales de Courtiers de Fret de France, 45 Quai des Grands Augustin, Paris 6, France. The map is printed on four sheets each approximately 32 by 27 inches in size. Distances in kilometers are marked along the waterways, which are classified according to depth by distinguishing symbols and

colors. Enlarged inset maps give details of the navigable waterways around the larger urban centers.

Interesting French election statistics are presented in the *Carte des Élections Legislatives du 17 Juin 1951*. Pie-graphs, graduated according to registered voting population, give the proportionate vote cast for the six major political parties, as well as the percentage of abstentions and void ballots by cantons, for the election in question. Enlarged insets give the same data for Paris and the Department de la Seine. The map was prepared by the Direction de la Documentation, Secrétariat Général du [French] Gouvernement, and printed in 1953 by l'Institut Géographique National. It is on two sheets each measuring 27 by 39 inches. The scale is 1 : 1,000,000.

Drs. Arthur Geddes and L. Dudley Stamp have prepared a map designed to show the present state of knowledge concerning the vegetation of Scotland. It is entitled *Vegetation Reconnaissance Survey of Scotland*. In addition to various types of vegetation, the map shows improved land and principal urban areas. A small inset map indicates relative reliability of data for various sections of the country. The main map is at the scale of 1 : 625,000 and measures 21½ by 40 inches. It was printed and published in 1953 by the Director General of the [British] Ordnance Survey, Chessington, Surrey.

A map of *The Nile Basin*, extending from 5° South Latitude to the Mediterranean Sea and from approximately 18° to 42° East Longitude, was published in 1952 by the Survey of Egypt. General relief is portrayed by contours and altitude tints. Cultural features mapped include towns, railways, international boundaries, marshes, swamps, and principal roads. The scale is 1 : 7,500,000 and the measurements are 32½ by 13½ inches.

The mean annual rainfall of Tunisia for the years 1900 to 1940 is presented on the *Carte des Précipitations* published in 1949 by the Ministry of Agriculture, Government of Tunisia. The map, printed on three sheets each measuring 25 by 37 inches, was compiled by H. Gaussen and A. Vernet, and printed by the [French] Institut Géographique National, 136 bis, Rue de Grenelle, Paris (VIIe). Thirteen rainfall intensities, ranging from below 100 millimeters to above 1,500 millimeters, are indicated in graded colors. The map is at the scale of 1 : 500,000.

The Geological Section, Mines Department, Perth, West Australia, published, in 1950, a *Geological Sketch Map of Western Australia* at the scale of 1 : 2,534,400. It is printed on two sheets each approximately 25 by 36 inches. Fifteen geological series, ranging in age from pre-Cambrian to Quaternary, are identified. Diagrammatic geological sections through the northern and southern portions of Western Australia accompany the map.

Trengganu Land Utilization Map is a detailed presentation of the major aspects of land use in Trengganu province on the eastern coast of Malaya. At the scale of 1 : 190,080 it shows, in addition to land utilization, various classes of roads, rivers and streams, administrative divisions and centers, state land, and forest reserves. The map, which is on two sheets each measuring 27½ by 33 inches, is a 1953 publication of the Survey Department, Federation of Malaya.

—WALTER W. RISTOW

The Canadian Surveyor Gets New Look

A NEW and extremely attractive cover page format now graces *The Canadian Surveyor*, beginning with the issue of January 1954. The new cover lends emphasis to the message from President A. Milne Floyd of the Canadian Institute of Surveying and Protogrammetry, printed in the same issue under the sub-title "Let's Be Smart Professionally."

"Perhaps too many of us," says Mr. Floyd, "are apt to float along on the human tide, taking things more or less as they come and not struggling too much until we are in a jam. I say let's be smart and anticipate some of these difficulties before they arise. It is extremely important to be smart in all stages and phases of survey work. Surveys are scientific collections of information necessary for the purpose of land subdivision, the building of power projects, the making of maps, and many other uses.

"Smart surveys mean accurate charts and maps. . . . Accurate maps may be the means of saving the lives of lost travellers, guiding a strayed aircraft back on the beam, or a ship back on course.

"The development of Canada, with accent on our mineral wealth, depends upon availability of accurate maps.

"Let us . . . be smart professionally and set the standards for others, who come after us, to emulate."

Books in Review

ATLAS OF SWEDEN. Subscription price is 20 Swedish Krona (approximately $4.00) per fascicule (i.e., 6 maps with text), plus costs of special wrapping and postage. Orders may be placed with the Generalstabens Litografiska Austalts Förlag, Stockholm 16, Sweden.

The foreign and domestic policies of a nation are based, to a greater or lesser degree, upon the national and cultural resources with which the country is endowed. Maps constitute one of the simplest and most lucid media for showing the distribution of such resources. That this fact is recognized by most of the world's nations is apparent in the number of physical and economic maps which are published by official mapping organizations in most of the countries of the world.

In a number of countries, series of distributional maps have been prepared in accordance with standard specifications and published in atlas format. Such "national" or "single country" atlases present the various aspects of a nation's land, people, and economic activities in a convenient and compact form. By presenting various phenomena and data on maps of uniform scale and format, it is possible to compare different distributional patterns and to arrive at generalized conclusions.

Czechoslovakia, Denmark, Egypt, Finland, France, Italy, and Mexico are among the countries which have published distinctive national atlases during the past twenty years. Similar atlases are under consideration or in progress in other countries. Among the latter is the *Atlas of Sweden* currently in production under the editorial direction of Svenska Sällskapet för Antropologi och Geografi. Cartography, reproduction, and printing are entrusted to AB Kartografiska Institutet, Esselte Ab, Stockholm, Sweden.

The Svenska Sällskapet, the oldest and largest geographical association in Sweden, has been planning the publication of a national atlas for a long time. Aided by grants from the Swedish government and from the Knut and Alice Wallenburg Foundation, and support from various business concerns and individuals, the Society was able to begin work on the atlas at the close of World War II.

The atlas project is under the direction of an editorial committee whose members are C. J. Anrick, Secretary of the Swedish Touring Club; Gerd Enequist, Professor of Geography, Upsala University; Ivar Högbom, Professor of Economic Geography and Principal of the Stockholm School of Economics; and Magnus Lindquist, Editor-in-Chief. The committee has the active collaboration of several agencies of the government and various subject specialists.

In compiling the atlas, the editorial committee aims to present the basic facts within each of the various sections and to satisfy practical economic interests as well as the needs of the pure scientist. The *Atlas of Sweden* is designed to present a description in maps and text of the natural features, population, and economy of Sweden. When completed the atlas will comprise a concentrated and graphic survey of the foundations on which the Swedish community rests.

The *Atlas of Sweden*, as planned, will include 150 pages of maps and 300 pages of text (Swedish with English summaries) and will be 34 by 43 centimeters in size. Some 1,000 maps, varying in scale from 1:2,000,000 to 1:12,000,000, will be included. The maps will be arranged under the headings of Geophysics and Geology, Meteorology and Hydrology, Flora and Fauna, Population, Agriculture, Forestry, Industry, Communications, Trade, Finance, Social Conditions, Cultural Conditions, Politics, and History.

The atlas is being issued in parts, each part comprising six pages of maps with descriptive text. Two parts were issued in 1953 including plates 15–16, 25–26, 29–30, 31–32, 61–62, and 63–64. Each subscriber will be provided with a leather-bound filing box in which the loose maps may be preserved. While the publishers suggest that the plates may be permanently filed in the box, many libraries will no doubt prefer to bind the atlas when all the plates have been received.

WALTER W. RISTOW
The Library of Congress

AMERICAN GEOGRAPHY: INVENTORY AND PROSPECT. Edited by Preston E. James and Clarence F. Jones. *Syracuse University Press*, for the Association of American Geographers, Syracuse, N. Y., 1954. 590 pages. $6.00.

During the last few years, several notable books have been published taking stock of the

accomplishments of geographers in the immediate past. To these can now be added *American Geography: Inventory and Prospect,* which presents a "progress report on the objectives and procedures of geographic research as of January 1954." Financially supported by the United States Social Science Research Council, National Research Council, and Office of Naval Research, "the book represents the combined thoughts of hundreds of professional American geographers," brought together by the Committee on American Geography of the Association of American Geographers, who sponsored the project. However, the book is not intended solely for geographers, but also for workers in other disciplines "who may want to know what American geographers are thinking and doing and what they hope to accomplish."

The approach to the inventory is through the systematic fields of the subject. Each chapter sets forth the views of a group of specialists in a phase of geography in which geographers in the United States have been actively at work or in which "the committee believes it is most essential that geographers should work." Thus the vast amount of research which has been done on Economic Geography has prompted six different treatments, which range from Marketing Geography to the Geography of Transportation. At the same time, the book meets the obvious necessity, in many places, of referring to earlier, usually European, work, and in about one-third of the twenty-six chapters, some of the contemporary work in Canada and other countries, is mentioned.

It is inevitable that certain facets of this many-sided discipline will hold greater appeal for some readers than for others. This reviewer found the chapter on Political Geography particularly satisfying. After a discussion on the nature of the topic, it deals with methods of study and the division of the world into political units, concluding with the problem of the analysis of the individual political region. The plea for further internal analyses of states, and for more attention to such minor organized units as townships and parishes, is well presented and is a field in which the geographer can contribute much to the development of his more immediate communities. This chapter also includes a survey of boundary studies, which will interest some surveyors and professional mapmakers, although their attention is more likely to be immediately arrested by the sections of the book on the Interpretation of Aerial Photographs and Geographical Cartography, the documentation of which includes many references to *Surveying and Mapping* and *Photogrammetric Engineering.* The illustrations include eight aerial photographs, in addition to maps which demonstrate the approaches of geographers to specific problems.

The index is rather puzzling as it lists some authors to which the text refers as briefly as others who are not indexed, and, in one instance, Prof. Eva Taylor's work appears in the index as that of Griffith Taylor. As the book will not only become an important reference work but also a well-used one, this is a slight, but only a slight, blemish.

This year, the Association of American Geographers is celebrating its semi-centennial and one hopes that its members will accomplish as much in the next fifty years as they have done in the past. They have set their sights high, and in so doing will rally their professional colleagues far beyond the borders of their own country.

NORMAN L. NICHOLSON
Geographical Branch, Department of Mines and Technical Surveys, Ottawa, Canada

Aluminum-Inserted Drawing Paper Offers Dimensional Stability

AN aluminum-insert drawing paper, imported from West Germany, has recently been reintroduced into the American market. The paper is made by the Schoeller Paper Mills in seven grades, with aluminum sheet inserts varying from 0.00118 inch in thickness to 0.0394 inch. High-quality drawing paper surfaces are permanently fused to both sides. Indications are that immersion in water for some length of time will not make the paper peel off the aluminum. Because of this permanence of fusion and the inherent stability of aluminum, the paper offers a good medium for the drawing of original maps and plans, where durability, resistance to climatic conditions, and dimensional stability are required. Other advantages cited by the makers are light weight and comparatively low cost.

The paper is available in sheets of any size up to 39 by 48 inches, and rolls up to 36 inches wide and 50 yards long, from the Geo-Optic Co., Inc., 170 Broadway, New York 36, N. Y.

MAP INFORMATION

This department was inaugurated for the purpose of bringing to the attention of the members information pertaining to the availability of maps, surveys, etc., with particular emphasis on how such material can be procured. It is believed that through an interchange and dissemination of such information maximum benefits will accrue to the surveying and mapping profession. —EDITOR

Topographic Maps

U. S. GEOLOGICAL SURVEY MAPS

The following quadrangle maps were published by the U. S. Geological Survey between December 1, 1953, and February 28, 1954. The list includes newly compiled maps; revised maps on which contours and drainage usually are unchanged but the works of man are brought up to date; and series-converted maps which are 15-minute maps produced from four 7½-minute maps of the same area. The maps are new unless otherwise designated by numerical superscript.

The quadrangle name (in capital letters) is followed by the name of the county (in upper- and lower-case letters) that contains the place or feature for which the quadrangle is named.

All maps are available with or without the green overprint that indicates woodland These maps show the shape and elevation of the land surface (represented by contour lines, printed in brown); water features (in blue); works of man, including cities, towns and scattered habitations, schools, churches, railroads, roads, boundaries, and place and feature names (in black); and woodland areas (in green). Principal roads are shown by a red overprint. In areas that have been covered by General Land Office Surveys, township and section lines are shown. The State rectangular coordinate systems are indicated in the margins of the maps. An information folder further describing topographic maps and symbols is available on request.

Standard quadrangle maps may be obtained for 20 cents per copy. A discount of 20 percent is allowed on orders amounting to $10 or more at the retail price. Orders should be addressed to the U. S. Geological Survey, Washington 25, D. C., (or Denver 15, Colo., for maps of areas west of the Mississippi River).

Alabama

CRAWFORD—Russell
PHENIX CITY—Russell

Alaska

CORDOVA (C-8)*—Third Judicial Division
HEALY (A-2)*—Third Judicial Division
HEALY (A-6)*—Third Judicial Division
HEALY (B-1)*—Third Judicial Division
HEALY (B-2)*—Fourth Judicial Division
HEALY (B-3)*—Fourth Judicial Division
HEALY (C-3)*—Fourth Judicial Division
MT. HAYES (A-6)*—Third Judicial Division

Arizona

CANELO PASS—Santa Cruz
DUQUESNE—Santa Cruz
ELGIN—Santa Cruz
FORT HUACHUCA—Cochise
FORT HUACHUCA NE—Cochise
FORT HUACHUCA SW—Cochise
HARSHAW—Santa Cruz
HUACHUCA PEAK—Cochise
LOCHIEL SE—Santa Cruz
MILLER PEAK—Cochise
MUSTANG MOUNTAINS—Santa Cruz
O'DONNELL CANYON—Santa Cruz
SONOITA—Santa Cruz
SUNNYSIDE SE—Cochise
SUNNYSIDE SW—Cochise

Arkansas

BOYD HILL—Lafayette
DEWITT²*—Arkansas
FOUKE—Miller
GARLAND—Miller
LEWISVILLE—Lafayette
OLD TOWN—Lafayette

California

ARBUCKLE—Colusa
ARROYO GRANDE*¹—San Luis Obispo
BRANCH MOUNTAIN*¹—San Luis Obispo
CAYUCOS*¹—San Luis Obispo

* Indicates 15-minute quadrangle; all others are 7½-minute quadrangles.
¹ Indicates a revised map.
² Indicates a series-converted map.
† Indicates availability in either a contour or a shaded-relief edition.

CHANCHELULLA PEAK*—Trinity
DIXON—Solano
FRUTO NE—Glenn
GLENN—Glenn
GRIDLEY—Butte
HAYFORK*—Trinity
HONCUT—Butte
KIRKVILLE—Sutter
KNIGHTS LANDING—Yolo
LA PANZA*[1]—San Luis Obispo
LIBERTY ISLAND—Solano
LOS MOLINOS—Tehema
MANTECA—San Joaquin
MAXWELL—Colusa
NEWHALL—Los Angeles
NEW HOPE—San Joaquin
OAT MOUNTAIN—Los Angeles
ONO*—Shasta
PALERMO*—Butte
POZO[1]—San Luis Obispo
SACATE—Santa Barbara
SANBORN SLOUGH—Butte
SANTA BARBARA[1]—Santa Barbara
STOCKTON EAST*—San Joaquin
STONYFORD*—Colusa
SUTTER CAUSEWAY—Sutter
TELESCOPE PEAK*—Colusa
WILLIAMS—Colusa
WILLOW CREEK*—Humboldt
WOODY*[1]—Kern
UNION ISLAND—San Joaquin

California-Oregon

TULELAKE*—Siskiyou

Colorado

JULESBURG SE—Sedgwick
JULESBURG SW—Sedgwick
OVID—Sedgwick
SQUARE S RANCH—Rio Blanco
WOLF RIDGE—Rio Blanco

Connecticut

DEEP RIVER[1]—Middlesex
MOODUS[1]—Middlesex
STAMFORD—Fairfield
WESTFORD[1]—Windham

Florida

ALFORD SE—Jackson
COMPASS LAKE—Jackson
LAKE WEOHYAKAPKA—Polk

Idaho

BIRDING ISLAND—Payette
WEISER COVE—Washington

Idaho-Oregon

OLDS FERRY SE—Washington

Illinois

ARROWSMITH*—McLean
ERIE*—Whiteside

Illinois-Indiana-Kentucky

WABASH ISLAND—Union

Illinois-Iowa

CLINTON—Clinton
CORDOVA—Rock Island

Indiana

BARGERSVILLE—Johnson
CATLIN—Parke
FOUNTAINTOWN—Shelby
LEWIS[1]—Vigo
MUNCIE WEST—Delaware
PENDLETON—Madison

Kentucky

AUSTERLITZ—Bourbon
BARBOURVILLE—Knox
BERNSTADT—Laurel
BILLOWS—Laurel
BROOKSVILLE—Bracken
CLEMENTSVILLE—Casey
CLINTONVILLE—Bourbon
CORBIN—Whitley
COWAN—Fleming
DAVISBURG—Bell
DAWSON SPRINGS SE—Christian
EQUALITY—Ohio
FOUNT—Knox
FRENCHBURG—Menifee
GERMANTOWN—Bracken
HAIL—Pulaski
HEIDRICK—Knox
HOMER—Logan
JUNCTION CITY—Boyle
KEENE—Jessamine
LEVEE—Montgomery
LILY—Laurel
LIVERMORE—McLean
LONDON—Laurel
LONDON SW—Laurel
MANCHESTER—Clay
MEANS—Menifee
MOUNT STERLING—Montgomery
ORANGEBURG—Mason
OWINGSVILLE—Bath
PERRYVILLE—Boyle
PIQUA—Robertson
PRESTON—Bath
RICHMOND NORTH—Madison
SARDIS—Mason
SHARPSBURG—Bath
SHERBURNE—Fleming
WOFFORD—Whitley
YOSEMITE—Casey

Kentucky-Tennessee

HAMLIN—Callaway

Kentucky-Indiana

RISING SUN—Ohio
UNIONTOWN—Union

Kentucky-Ohio

MAYSVILLE WEST—Mason

Louisiana

CALHOUN*—Ouachita
LAKE CATAOUATCHE EAST[1]—Jefferson
LAKE CATAOUATCHE WEST[1]—St. Charles
NEW ORLEANS EAST[1]—Orleans
NEW ORLEANS WEST[1]—Jefferson
RUDDOCK[1]—St. John the Baptist

Maine

JO-MARY MOUNTAIN*—Piscataquis

Maryland

ODENTON[1]—Anne Arundel
PORT TOBACCO—Charles
WALKERSVILLE[1]—Frederick

Maryland-Virginia

BUCKEYSTOWN[1]—Frederick
INDIAN HEAD—Charles
MT. VERNON—Fairfax
POOLESVILLE[1]—Montgomery

Massachusetts

QUABBIN RESERVOIR[1]—Franklin
SOUTH GROVELAND[1]—Essex
WINSOR DAM[1]—Hampshire

Massachusetts-New Hampshire

HAVERHILL[1]—Essex
NEWBURYPORT WEST[1]—Essex

Michigan

ALLENTON[1]—St. Clair
BELLE ISLE[1]—Wayne
BELLEVILLE[1]—Wayne
FLAT ROCK[1]—Wayne
GROSSE POINTE[1]—Wayne
MEMPHIS—Macomb
MONROE[1]—Monroe
MT. CLEMENS WEST—Macomb
STONY POINT[1]—Monroe
WARREN[1]—Macomb

Michigan-Ohio

ERIE—Monroe

Missouri

BOONVILLE—Cooper
CALIFORNIA NORTH—Moniteau
CALIFORNIA SOUTH—Moniteau
CLARKSBURG—Moniteau
FORTUNA—Moniteau
HILLDALE—Howard
NEW FRANKLIN—Howard
PRAIRIE HOME—Cooper
ROCHEPORT—Boone
TIPTON—Moniteau

Montana

BANNACK—Beaverhead
BOZEMAN*—Gallatin
BOZEMAN PASS*—Gallatin
CHADBURN—Park
DUCK CREEK PASS*—Broadwater
ENNIS*—Park
GOBBLERS KNOB—Park
HUNTERS HOT SPRINGS—Park
LIVINGSTON—Park
MAUDLOW*—Gallatin
SPRINGDALE—Park
TOWNSEND*—Broadwater

Nevada

BLUE DIAMOND*—Clark
LAS VEGAS*—Clark
PINE VALLEY*—Eureka

New Hampshire-Massachusetts

AYERS VILLAGE[1]—Essex

New Mexico

BASIN WELL—Chaves
DALIES—Valencia
HUBBLE SPRING—Bernalillo
MT. SEDGWICK—Valencia
POST OFFICE FLAT—Valencia
SANTA FE†—Santa Fe
VALLE LARGO—Valencia
WIND MESA—Bernalillo

New York

ALEXANDRIA BAY*[2]—Jefferson
ANTWERP*[2]—Jefferson
HAMLIN[1]—Monroe
HILTON[1]—Monroe
ONTARIO—Wayne
PALMYRA—Wayne
SPENCERPORT[1]—Monroe
WEBSTER[1]—Monroe
WILLIAMSON—Wayne

North Carolina

JACKSON SPRINGS*[2]—Moore
LAURINBURG*[2]—Scotland

North Carolina-South Carolina

HAMLET*[2]—Richmond

Ohio

CANFIELD—Mahoning
GENOA[1]—Ottawa
GRAND RAPIDS[1]—Wood
LAKE MILTON—Mahoning
OAK HARBOR—Ottawa
RENO BEACH[1]—Lucas
SOUTHINGTON—Trumbull
WEST FARMINGTON—Trumbull

Ohio-Kentucky

MAYSVILLE EAST—Mason

Oregon

LYONS*—Linn

Puerto Rico

BAYANEY[1]—Hatillo
CAGUAS[1]—Caguas
CAYEY[1]—Cayey
CIALES[1]—Ciales
COMERIO[1]—Comerio
COROZAL[1]—Corozal
FLORIDA[1]—Barcelonita
NARANJITO[1]—Naranjito
UTUADO[1]—Utuado
YABUCOA[1]—Yabucoa

Rhode Island

CAROLINA—Washington

South Carolina

EASTOVER*—Richland

Tennessee
CHESTNUT BLUFF—Crockett
COTTAGE GROVE—Henry
DOVER—Stewart
FOWLKES—Dyer
GOODLETTSVILLE—Davidson
McKINNON—Houston

Tennessee-Kentucky
PURYEAR—Henry

Texas
AUSTWELL—Refugio
CEDAR LANE—Matagorda
CEDAR LANE NE—Brazoria
DANCIGER—Brazoria
DOUGLASS*—Nacogdoches
FORT HOOD*[2]—Coryell
GATESVILLE*[2]—Coryell
KAMEY—Calhoun
KELLER BAY—Calhoun
KILLEEN*—Bell
LANE CITY—Wharton
LANE CITY SE—Matagorda
LA SALLE—Jackson
LA WARD—Jackson
MANSON—Jackson
MARKHAM—Matagorda
MOSQUITO POINT—Calhoun
NACOGDOCHES*—Nacogdoches
OLIVIA—Calhoun
PIERCE—Wharton
POINT COMFORT—Calhoun
PURMELA*—Coryell
PORT MANSFIELD—Willacy
POTRERO LOPENO NW—Kenedy
POTRERO LOPENO SW—Kenedy
SEADRIFT—Calhoun
SLOCUM*—Anderson
SOUTH BIRD ISLAND—Kleberg
TIVOLI SE—Aransas
TIVOLI SW—Refugio
TURTLE BAY—Matagorda
VAN VLECK—Matagorda

Utah
CLAY HILLS 4 SW—San Juan
SCIPIO NORTH*—Millard

Utah-Colorado
SWALLOW CANYON—Daggett

Vermont
BOLTON MOUNTAIN—Chittenden
BURLINGTON—Chittenden
ESSEX CENTER—Chittenden
ESSEX JUNCTION—Chittenden
FORT ETHAN ALLEN—Chittenden
GEORGIA PLAINS—Franklin
GILSON MOUNTAIN—Franklin
HINESBURG—Chittenden
HUNTINGTON—Chittenden
JEFFERSONVILLE—Lamoille
MILTON—Chittenden
MOUNT MANSFIELD—Chittenden
MOUNT PHILO—Chittenden
RICHMOND—Chittenden
UNDERHILL—Chittenden
WATERBURY—Washington

Virginia
GAINESVILLE[1]—Prince William
INDEPENDENT HILL—Prince William
JOPLIN—Prince William
LINCOLN[1]—Loudoun
NOKESVILLE[2]—Prince William
OCCOQUAN—Prince William
PURCELLVILLE[1]—Loudoun

Virginia-Maryland
BELVOIR—Fairfax
LEESBURG[1]—Loudoun
QUANTICO—Prince William
WATERFORD[1]—Prince William

Virginia-North Carolina
MILTON*—Coswell

Virginia-West Virginia
ROUND HILL[1]—Loudoun

Washington
DEEP LAKE—Stevens
GILLETTE MOUNTAIN—Stevens
KELLER*—Ferry
LAKE SHANNON*—Skagit
LAKE WHATCOM—Whatcom
SPIRIT—Stevens
TWIN LAKES*—Ferry

Wyoming
ANTELOPE RIDGE—Fremont
ARAPAHOE BUTTE—Fremont
ARMINTO—Natrona
ARMINTO NW—Natrona
BADWATER—Natrona
BATTLE MOUNTAIN—Hot Springs
BUTTE WELL—Fremont
COTTONWOOD PASS—Fremont
COYOTE SPRINGS—Fremont
DEADMAN BUTTE—Natrona
DE PASS—Fremont
ERVAY BASIN SW—Natrona
GAS HILLS—Fremont
GUFFY PEAK—Hot Springs
HAYBARN HILL—Fremont
HILAND—Natrona
KATES BASIN—Hot Springs
LOVE RANCH—Fremont
LYSITE SE—Fremont
MADDEN—Fremont
MILES RANCH—Fremont
PICARD RANCH—Fremont
RATHBURN RANCH—Hot Springs
RONGIS RESERVOIR—Fremont
RONGIS RESERVOIR SE—Fremont
SEVENTY-ONE RESERVOIR—Fremont
SHEEP RIDGE—Hot Springs
SIOUX PASS—Natrona
SQUAW BUTTE—Fremont
SQUAW BUTTE NE—Fremont
TIN CUP MOUNTAIN—Fremont
WALTMAN—Natrona
WALTMAN NW—Natrona
WILDERNESS—Fremont
WISE FLAT—Fremont

In addition to the standard series of quadrangle maps, small-scale (1:250,000) maps of areas in the United States and Territories are being published and distributed. Some of these maps are published in a shaded-relief edition, as indicated in the list below. They may be purchased from the Geological Survey for 50 cents per copy. An index to the series is available on request.

Arizona-Sonora, Mexico
SONOYTA†

District of Columbia-Maryland-Virginia
WASHINGTON

Hawaii
HAWAII NORTH†
HAWAII SOUTH†
KAUAI†
MAUI†
OAHU†

Illinois-Missouri-Kentucky
PADUCAH†

Kansas-Missouri
JOPLIN†
LAWRENCE†

Kansas-Missouri-Nebraska
KANSAS CITY

Kentucky-Indiana
EVANSVILLE†

Louisiana
NEW ORLEANS

Michigan-Ontario, Canada
DETROIT

Missouri
JEFFERSON CITY†
SPRINGFIELD†

Missouri-Arkansas
HARRISON†

New York-Ontario, Canada
TORONTO

Oklahoma-Arkansas
FORT SMITH†

Oklahoma-Missouri-Arkansas
TULSA†

Pennsylvania
PITTSBURGH

Pennsylvania-New York
WILLIAMSPORT

Washington-Oregon
COPALIS BEACH†

West Virginia-Ohio
CHARLESTON†

MISSISSIPPI RIVER COMMISSION MAPS

Publication of the following quadrangle maps has been announced by the Mississippi River Commission. These maps are similar to quadrangle maps published by the Geological Survey (except that they are all in the 15-minute series) and are listed in a similar manner. Mississippi River Commission maps are available from the Commission office, P. O. Box 80, Vicksburg, Miss., at 20 cents per copy.

BRETON ISLAND—Plaquemines, La.
NAPOLEONVILLE[1]—Assumption, La.
SARDIS—Panola, Miss.

Lake Survey Charts

Publication of new editions of the following Lake Survey Charts has been announced by the United States Lake Survey of the Corps of Engineers, U. S. Army. Copies of these charts may be obtained from the U. S. Lake Survey, 630 Federal Building, Detroit 26, Mich., at 75 cents per copy. Payment is required in advance by P. O. money order or draft, payable to the Treasurer of the United States.

Lake Champlain

173.—Four Brother Islands to Barber Point, N. Y., at 1:40,000 (October 1953).

Lake Erie

32.—Coast chart. Sturgeon Point, N. Y., to 13 miles east of Erie, Pa., at 1:80,000, with an inset of Dunkirk Harbor, N. Y., at 1:15,000 (December 1953).

332.—Erie Harbor and Presque Isle, Pa., at 1:15,000 (October 1953).

342.—Ashtabula Harbor, Ohio, at 1:5,000 (October 1953).

346.—Fairport Harbor, Ohio, at 1:8,000 (October 1953).

363.—Huron Harbor, Ohio, at 1:5,000 (October 1953).

Lake Michigan

76.—Coast chart. South Haven, Mich., to Benona, Mich., at 1:120,000, with insets of South Haven, Mich., at 1:10,000 and Saugatuck, Mich., at 1:15,000 (December 1953).

705.—Coast chart. Platte Bay, Mich., to Lake Leelanau, Mich., including the Manitou and Fox Islands, at 1:80,000, with an inset of Leland, Mich., at 1:2,500 (October 1953).

706.—Coast chart. Grand Traverse Bay and Little Traverse Bay, Mich., at 1:80,000, with insets of Petoskey, Mich., and Harbor Springs, Mich., at 1:10,000, and Traverse City, Mich., at 1:15,000 (December 1953).

768.—White Lake, Whitehall, and Montague, Mich., at 1:10,000 (January 1954).

777.—Portage Lake, Mich., at 1:10,000 (January 1954).

789.—Lake Charlevoix, Mich., at 1:30,000, with an inset of Charlevoix, Mich., at 1:10,000 (October 1953).

Lake Ontario

24.—Coast chart. Braddock Point, N. Y. to Thirty Mile Point, N. Y., at 1:80,000 (October 1953).

225.—Oswego Harbor, N. Y., at 1:10,000 (October 1953).

234.—Sodus Bay, N. Y., at 1:10,000 (October 1953).

New Edition of Chesapeake Bay Chart

THE SECOND EDITION of nautical chart 553 covering Patuxent River and vicinity, Chesapeake Bay, has just been published by the Coast and Geodetic Survey, U. S. Department of Commerce.

The new edition was completely reconstructed from recent surveys by the Coast and Geodetic Survey. Hydrographic and topographic details have been extensively revised and the chart limits extended. Chart 553 cancels chart 539, previously published.

Chart 553 is part of a series of 1:40,000 scale charts of the Chesapeake Bay area designed to provide greater coverage and utilization for the chart user. Chesapeake Bay, which is 170 miles in length, is the largest inland body of water on the east coast of the United States. The bay carries a large trade in foreign and domestic vessels and is also the center of a large oystering and fishing industry. Patuxent River is located on the western side of the bay, 87 miles above the entrance.

Water depths are accentuated on the new edition by a blue tint carried to the 12-foot curve. Restricted, cable, and pipeline areas are shown in purple. Lights, beacons, buoys, and dangers to navigation are corrected for information received to date of issue.

A continuation of Patuxent River to Nottingham is shown as an inset on the chart. Boundary lines of fishtrap areas are designated. Roads, railroads, and other cultural features are shown. Relief of the land area is indicated by contours spaced at 40-foot intervals.

Copies of the new edition are distributed by the sales agents, district offices, and the Washington office of the Coast and Geodetic Survey. The price is $1.00 per copy.

TIDE TABLES

A new edition of tide tables for 1955 for the east coast of North and South America, including Greenland,—Serial No. 771—has recently been issued by the Coast and Geodetic Survey.

The tables contain full predictions for 44 reference stations and differences and constants for about 1,600 stations.

Comment and Discussion

The pages of SURVEYING AND MAPPING are open to a free and temperate discussion of all matters pertaining to the interests of the CONGRESS. It is the purpose of this Department to encourage comments on published material or the presentation of new ideas in an informal way.
—EDITOR

PRECISION AND ACCURACY

B. GOUSSINSKY*—Hugh C. Mitchell has rightly pointed out the importance of discriminating between the terms *precision* and *accuracy* so much used by surveyors.[1] It is evident that the two terms do not have the same meaning, and that strict definitions should be given them. The definitions as given in the U. S. Coast and Geodetic Survey Special Publication No. 242 are certainly correct and to the point.

A question arises whether the engineer will adhere to these definitions in the course of his work and will not use them in a loose way. The reason for this doubt lies in the fact that the terms originated from everyday life and were applied in surveying when it was not yet a science, but an art.

It should be remarked here that this applies equally to other languages. Thus in French we have *precision* and *exactitude*, and in German, *präzision* and *genauigkeit*. That one and the same meaning in different languages is not expressed by the same word can be seen from the fact that whereas in English one can say *precise leveling* and *precise traverses*, the corresponding expressions in German are *präzisionsnivellement* and *genaue polygonisierung*.

It appears necessary, therefore, to apply something that is more rigid than a worded definition, and that can always be closely associated with the term. This can be achieved only by giving the definition a mathematical meaning.

In this connection, an example can be given from Jordan's definition of accuracy (genauigkeit), which, according to him, is inversely proportional to the mean square error, as opposed to *weight* which is inversely proportional to the square of the mean square error.[2]

I do not propose to accept Jordan's definition; it has been given only as an example. But the question is worthy of consideration. Some kind of mathematical definition of the terms *precision* and *accuracy* is certainly possible, and as the term *weight*, belongs to the same class of conceptions, it may also be desirable to define it in relation to the other two terms.

* Survey of Israel, Tel Aviv, Israel

[1] MITCHELL, HUGH C., Precision and Accuracy, SURVEYING AND MAPPING, October–December 1952, pp. 374–375.

[2] JORDAN, W., Handbuch der Vermessungskunde, Vol. II, 1920, p. 26.

Plane Coordinate Intersection Tables

THE Coast and Geodetic Survey, Department of Commerce, has recently issued plane coordinate intersection tables for the States of North Dakota, North Carolina, and Utah—Special Publication Nos. 309, 310, and 311. These publications are part of a series which will ultimately include all States. Tables for Nebraska, Florida, Wyoming, Minnesota, and Wisconsin have already been issued.

The tables, which contain plane coordinates for 2½-minute intersections of meridians and parallels based on the State plane coordinate system, are sold by the Superintendent of Documents, Washington, D. C.

News of Related Organizations

Texas Surveyors Association

During 1954 the Texas Surveyors Association plans to devote considerable time and attention to its legislative program in preparation for the January 1955 session of the State Legislature. In an effort to secure enactment of the proposed Registered Land Surveying Act at this session, the association has engaged an attorney to redraft the bill and to advise and work with the association.

The Association, through its Ethics and Fair Practice Committee, is also working on a draft of suggested rules of practice for land surveyors.

Also under study by a special committee is the drafting of a proposal to set up a Texas Bureau of Surveys and Maps.

Present membership of the organization stands at 400. Efforts are being made to double that figure during the year.

The 1954 officers of the Association include E. D. Morse, *President;* Fred Williamson, *First Vice-President;* Frank T. Drought, *Second Vice-President;* J. D. Freeman, *Third Vice-President;* and William Shirriffs, *Secretary-Treasurer.*

WILLIAM SHIRRIFFS

Michigan Land Surveyors Hold Thirteenth Annual Conference

The Thirteenth Annual Conference of the Michigan Society of Registered Land Surveyors was held at the Morton House in Grand Rapids, Mich., on February 18, 19, and 20, 1954. Prof. Leo Nothstine of Michigan State College, President for the past year, presided at the opening session. The agenda consisted of committee reports and new business.

The Conference was welcomed to Grand Rapids by City Manager M. M. Moore, R.L.S. George F. Houndt, representing the General Casualty Line, discussed necessary insurance for land surveyors. W. J. Robbins, another expert on insurance problems, talked about "Errors and Omissions."

Ewing Jones, Land Planning Consultant for the Federal Housing Administration, gave a very interesting talk, illustrated by slides, showing the part that the land surveyor should take in the planning of subdivisions.

A seminar on the preparation and interpretation of legal descriptions took up the second day of the conference. W. B. Williams, who was general chairman of the Conference, acted as moderator. Members of the Michigan Bar Association, the Michigan Title Association, and the American Congress on Surveying and Mapping living in the Great Lakes District were guest participants in the discussion, together with members of the Society.

Two of the principal speakers at the conference were John B. Martin, Auditor General of the State of Michigan, who explained the proposals for revising the State plat law, and Sol A. Bauer of Cleveland, Ohio, a Past-President of the American Congress on Surveying and Mapping, who talked on the professional aspects of land surveying.

The conference closed with a final business meeting at which new officers were chosen as

follows: John McMahon of Detroit, *President;* Wenley Smith of Paw Paw, *Vice President;* Dean Delamater of Cheboygan, *Secretary;* and S. J. E. Lucas of Mio, *Treasurer.* It was decided to hold the next Annual Conference at East Lansing where the Civil Engineering Department of Michigan State College will act as host.

GEORGE M. BLEEKMAN

Conference on Surveying and Mapping in Maryland

The Maryland Bureau of Control Surveys and Maps, in cooperation with the University of Maryland, sponsored a conference on Surveying and Mapping in Maryland on March 3, 1954, at the University in College Park.

After the opening of the conference by Dean S. S. Steinberg, University of Maryland, the following discussions were presented: "The Maryland Bureau of Control Surveys and Maps," by George W. Cassell, Bureau of Control Surveys and Maps; and "Maryland State Plane Coordinate System," by Lansing G. Simmons, U. S. Coast and Geodetic Survey. Carroll F. Merriam, President of ACSM, presented a paper on "Preserving the Old Order."

During the afternoon session of the conference, a panel discussion was held on "Use of Plane Coordinates," with Draper K. Sutcliffe serving as moderator. Members of the panel were Richard W. Cooper, Registered Land Surveyor; Page F. Hopkins, Maddox and Hopkins Civil Engineers; Thomas B. Howard, Jr., J. Spence Howard and Co.; J. R. McCrone, Jr., Registered Engineer and Land Surveyor; Leo W. Rader, Registered Land Surveyor; Thomas W. Shives, Anne Arundel County Sanitary Commission; and J. H. Seibert, Washington County Surveyor.

An extensive exhibit of surveying, mapping, and other instruments and supplies was also included in the conference.

GEORGE W. CASSELL

East Bay Council on Surveying and Mapping

The East Bay Council on Surveying and Mapping started its second full year with a backward look at its many accomplishments and a resolve to accomplish more in '54. At a February meeting in the Alameda City Hall, reports indicated that heretofore surveying has been emphasized. Duplication in control surveys and monument recording has been virtually eliminated, though it still exists in mapping.

F. H. Moffitt, Assistant Professor of Civil Engineering at the University of California, outlined the proposal that the Technical Committee should be informed of any proposed or anticipated mapping projects. This committee would attempt to work out cooperative projects as it has done with surveys. The concurrent scheduling of adjacent or overlapping projects would permit considerable savings.

C. O. Greenwood, Jr., Photogrammetrist and Registered Civil Engineer, delivered a very informative address on photogrammetric mapping. One very important item that he stressed was the need for permanent monumentation of second-order control for photogrammetric mapping. He readily admits that third-order control will do for the mapping, but questions the practicability of it. Usually the mapping is followed by property acquisition and construction which requires second-order control which should have been established in the first place.

Officers elected for 1954 are: Albert E. White, Assistant Director of Public Works in Richmond, *Chairman;* and Al Milano, Contra Costa County Surveyor's Office, Court House, Martinez, *Secretary.*

C. A. WOOLDRIDGE, JR.

Virginia Association of Surveyors

The newly-organized Central Virginia Chapter of the Virginia Association of Surveyors began operations in March with a membership of 25. Payne Johnson is President of the Chapter and Ran Highland serves as Secretary-Treasurer.

The Northern Virginia Chapter recently began its second year with 32 members. Jim Payne is President and Merlin McLaughlin is the Secretary-Treasurer.

The Association recently entered into a cooperative training arrangement with the International Correspondence Schools. This program provides a worthwhile opportunity for members or their employees to enroll in home study courses in surveying and mapping at substantial discounts.

(EDITOR'S NOTE.—The above information was contained in "Plum Chatter," Vol. 1, No. 1, an interesting news letter put out by the Virginia Association and edited by Victor H. Ghent, Secretary-Treasurer.)

ASCE Forms New Committee On Pipelines

The following letter was recently received by ACSM from William N. Carey, Executive Secretary of the American Society of Civil Engineers:

The American Society of Civil Engineers recently established, within the framework of its Construction Division, a Committee on Pipelines. The purpose of this committee is to advance and correlate scientific knowledge, to promote and coordinate economic development and construction of engineering projects in connection with the transmission of fluids, gases, or solids by means of pipelines and as it pertains to the science of Civil Engineering, particularly in the fields of surveying line locations, design, construction, and operations.

Another purpose of this committee is to promote and further mutual utilization of the established codes for pressure piping as among pipeline, highway, and railroad groups, and public authorities.

The Board of Direction of ASCE believes that there may be members of your organization interested in the operation of this Pipeline Committee, if they were informed of its existence.

Please feel free to call on us for any supplementary information if desired.

Interested members of ACSM can contact the Committee on Pipelines, Construction Division, ASCE, 33 West 39th St., New York 18, N. Y., for any additional supplementary information. It is believed that the Committee will welcome any assistance that ACSM members may be able to give in furtherance of its work.

NEW CHARTS OF LAKE MICHIGAN

NEW EDITIONS of the following Lake Michigan coast charts, bearing the edition date of February 1954, have been released by the U. S. Lake Survey, Corps of Engineers, U. S. Army:

No. 77.—Benona, Mich., to Point Betsie, Mich., at a scale of 1:120,000, with insets of Pentwater, Mich., and Frankfort, Mich., at a scale of 1:10,000.

No. 704.—Beaver Island Group, Waugoshance Point, Mich., to Bowlder Reef, and North Shore from Brevort, Mich., to Seul Choix Point, Mich., at a scale of 1:80,000, with insets of Port Inland, Mich., at a scale of 1:10,000, and Beaver Harbor, Beaver Island, Mich., at a scale of 1:15,000.

Copies of these charts may be procured at 75 cents each. Mail orders should be addressed only to the U. S. Lake Survey, 630 Federal Building, Detroit 26, Mich. Advance payment is required with the order, by P. O. money order or draft, payable to the Treasurer of the United States.

CONGRESS NEWS

Annual Business Meeting

The American Congress on Surveying and Mapping convened at three o'clock on March 24, 1954, in the Terrace Banquet Room, Hotel Shoreham, Washington, D. C., for its annual business meeting. President Merriam opened the meeting by reading messages of greeting from G. H. Harding, W. L. Wattles, and L. H. Berger. Members of the Advisory Council, division chairmen, and representatives of local sections were introduced. Program Chairman Robert H. Randall, Jr., was thanked for his work in connection with the annual meeting.

The following is an edited version of the stenotypist's transcript of the main proceedings:

RESOLUTIONS

PRESIDENT MERRIAM: Captain Hoskinson is Chairman of the Resolutions Commitee. These resolutions are offered to this body to be referred to the Board of Direction which meets at eight o'clock this evening. Captain Hoskinson, I wonder if you would step up and read the resolutions which have been prepared.

CAPTAIN HOSKINSON: Gentlemen, may I say first that this is a totally new experience for me. I have never dealt with resolutions in any organization before. I find that it is very difficult in the short time that we have here at the meeting to get these things out in an edited form and I wouldn't say they are in an edited form by any means right now. However, I can give you the sense of these resolutions and I can hope that before eight o'clock tonight, I will have them in a little better shape.

Resolution for Tying Federal-aid Road Surveys to State Plane Coordinate Systems

(Approved text of resolution not available for this issue.)

Resolution Urging Highway Departments to Increase Efforts Toward Preserving Survey Monuments

(Approved text of resolution not available for this issue.)

Resolution Commending General Chairman of Annual Meeting

Resolved, that the members of the American Congress on Surveying and Mapping convey their appreciation to Helmuth Bay, General Chairman of the Fourteenth Annual Meeting, and also to the members of his staff for assistance for this extremely successful meeting.

Resolution Commending Executive Secretary

Resolved, that the members of the American Congress on Surveying and Mapping do herewith commend Walter S. Dix, Secretary of ACSM, for a splendid spirit of cooperation and for the tireless efforts which he has given to the promotion of the affairs of ACSM, not only for this year, but for every year that he has held this important office.

Resolution to Improve Our Program of Surveying and Mapping

(Approved text of resolution not available for this issue.)

Resolution of Greeting to the International Union of Geologists and Geophysicists

Resolved, that the members of the American Congress on Surveying and Mapping extend greetings to the International Union of Geologists and Geophysicists for a very successful meeting in Rome in 1954.

Resolution of Greeting to the Pan-American Institute of Geography and History

Resolved, that the members of the American Congress on Surveying and Mapping extend greetings to the Pan-American Institute of Geography and History for a very successful meeting in Mexico City in 1954.

Resolution Urging Issuance of Postage Stamp to Commemorate Land Survey

(Approved text of resolution not available for this issue.)

I, herewith, submit these to the Chairman, and before eight o'clock tonight, I will have them in a little better editorial form.

PRESIDENT MERRIAM: These resolutions have been presented to this meeting before presentation to the Board of Direction this evening. Is there any discussion, any objection, or modification?

(Some minor amendments were suggested from the floor.)

PRESIDENT MERRIAM: Are there any further suggestions, additions, or subtractions? If not, is it the consensus of this meeting that these resolutions shall be referred to the Board of Direction meeting this evening? Can I hear a motion.

MR. WILLIAMS: I so move.

MR. STIEFEL: Second.

(The motion was carried.)

PRESIDENT MERRIAM: On financial matters, we always like to hear from our Treasurer, Richard T. Evans.

TREASURER'S REPORT

MR. EVANS: I have very little to say so I can say it from here. The Treasurer is concerned with the receipt of annual dues, and the annual dues have been coming in a flood, and the flood continues.

The membership is increasing and that increases the amount of receipts.

I think I can just refer you to the financial statement on page 113 of the January-March 1954 issue of the Journal, which summarizes the work of the Treasurer. Right now, there is more coming in and in the next few days, there will be a lot going out to settle for this Fourteenth Annual Meeting, but the financial standing of the American Congress on Surveying and Mapping is improving each year, and that is the way we want it to continue. Thank you.

PRESIDENT MERRIAM: Thank you very much, Mr. Evans.

REPORT OF PROFESSIONAL STATUS COMMITTEE

PRESIDENT MERRIAM: A committee in which I have particular interest is the Professional Status Committee because I know we have as a chairman a man whose philosophy I always enjoy, Sol A. Bauer. Mr. Bauer, I wonder if you would step up here.

MR. BAUER: The activities of the Professional Status Committee, during the past year, consisted primarily of acting upon current problems of professional status that were brought to its attention. These consisted of such matters as:

1. Expression of opinion relative to professional insurance.
2. The perennial question of competitive bidding for professional services.
3. A recommendation for the listing of surveyors under a professional listing in the classified pages of the telephone directories, in a manner similar to that recently approved for professional engineers.
4. The matter of credit recognition for surveys by architects who use surveys as a basis for architectural site plans.
5. Numerous matters dealing with the registration of surveyors, and attempts of various State groups to achieve surveyor registration where it does not now exist.
6. Two questions, one of legal rights of surveyors and one of jurisdiction: (*a*) whether a registered surveyor is entitled to the same statute of limitations privilege that is granted to the legal and medical professions; and (*b*) to what extent a surveyor may be forced by subpoena to reveal his private notes and records, and explain the significance thereof, in a court of law in a case with which he has no immediate connection.

These and other matters have made clearer the need for, and the responsibilities of, a professional status committee as a part of the ACSM organization.

Progress has been made in the direction of a clearer understanding of the criteria that establish professionalism. It is to be hoped that, within the coming year, the committee will be able to recommend an acceptable definition of the word "profession," as it applies to surveying and mapping and their relation to the various functions within the broad field. Also, it is hoped that the committee might develop a statement relative to the principal fields of activity to which surveying and mapping most closely belong.

As time progresses, it seems to your chairman that matters of increasing importance will be brought to the attention of this committee for study, to the point that this might become one of the important working committees of ACSM.

Because of the diversity of interests among the members of the committee, and their wide geographic distribution, meetings of the committee have been impossible, and such intercommittee business as has been handled has been primarily through the mails. As is always true in such a situation, much of the work devolves upon the chairman of the committee.

It is therefore the recommendation of your chairman that the Professional Status Commit-

tee should be continued as a permanent standing committee, that its members should continue to be chosen from as many phases and viewpoints as is possible within the ACSM membership, and that continuity of direction of the Committee be preserved through the expedient of what might be called, for want of a better name, an Executive Board, which smaller group would maintain the closest and most intimate understanding of the varied problems of professional status, and in this manner would provide the continuity of thought and principle that would form the basis of ACSM policy on professional matters.

Your chairman has had much help of this sort from Vice Chairman R. H. Lyddan, with constant and wise support from the Executive Secretary of the ACSM, Walter S. Dix, to whom in particular, and the others on the committee in general, your chairman renders thanks.

REPORT OF PUBLICATIONS COMMITTEE

PRESIDENT MERRIAM: Is there any discussion on this report? If not, I wish to present to you the Publications and Editing staff. I have had the pleasure of seeing and working with Chairman Morris M. Thompson. I wonder, Mr. Thompson, if you have a word to say about publications.

MR. THOMPSON: Gentlemen, the Publications Committee reports to you four times a year in the form of our quarterly journal, SURVEYING AND MAPPING. Therefore, I don't believe a detailed report is necessary at this time.

I would, however, like to acquaint you with the people who make the Journal happen, for it is something of a trick to publish a magazine like ours without any paid help whatsoever.

The members of the newly constituted Publications Committee are: for the Cartography Division, Dr. Walter W. Ristow; for the Education Division, Prof. Raymond P. Eyman; for the Instruments Division, Howard S. Rappleye; for the Control Surveys Division, Prof. Milton O. Schmidt; for the Property Surveys Division, Prof. Frank C. Mirgain; for the Topography Division, Harold R. Brooks; and for general matters, Capt. Frank S. Borden, Rear Admiral K. T. Adams, and Calvin S. Maltby.

The key man is, of course, our Editor-in-Chief, Robert C. Eller. Bob Eller has devoted a tremendous and a very fruitful effort to his job and you all know what a fine job he has done.

He is ably assisted by three Assistant Editors: Joseph P. Burns, Bernard Schechter, and Richard E. Niswander.

I would like to thank the outgoing members of the Publications Committee for their valuable assistance in the past: Arthur F. Striker, Gordon E. Ainsworth, and Lester C. Higbee. I would also like to thank Lyman D. Lynn for his very capable handling of our regular department on current literature and Dr. Walter Ristow for his very informative feature on distinctive recent maps.

One final word, the Publications Committee welcomes comment by individual members on the content of SURVEYING AND MAPPING. Only by the expression of such views is it possible for the Committee to know whether it is rendering the best possible service to the ACSM. Please write and tell us what you really think. Probably we won't get mad, and even if we do, we will get over it and we may even print your comment. Thank you.

EDITOR'S REPORT

(The Editor-in-Chief, Robert C. Eller, was unable to be present at the meeting to deliver his report. His written report is printed here in the place it would normally have occupied on the program.)

MR. ELLER: The editors of SURVEYING AND MAPPING believe that theirs is one office of the American Congress on Surveying and Mapping which hardly needs to make an annual report, as their work is open to inspection by all the members four times a year. However, certain factual information might be of interest to the membership.

The four regular issues of the Journal published in 1953 comprised a total of 548 pages, with an average of 3,850 copies of each issue being printed. These figures represent a continuation of the steady growth of the Journal since its inception and are made possible only through continuous growth of the membership.

During the year a total of 20 principal articles were reprinted. In addition, reprints were prepared of each of the 4 lists of New Members.

The number of advertisers increased from 15 to 26 during the year. Schaler, Butler & Associates, exclusive advertising agents for the Journal, have worked hard to make this increase possible. It is their belief that the field of potential advertisers has hardly been touched as yet.

Among the improvements made in the Journal during the year, perhaps the one most obvious to members was the change in cover stock and color. This change was made in an effort to secure better reproduction of advertisements on the covers.

Other improvements include the introduction of a new department on News of Related Organizations wherein all such items can be grouped in one place for ready reference, and a decided increase in the proportion of illustrations.

Two assistant editors—Richard E. Niswander of the U. S. Coast and Geodetic Survey, and Bernard Schechter of the Army Map Service—were added to the editorial staff near the end of the year. Through their help the heavy workload on the Editor-in-Chief is being increasingly lightened.

I wish to express appreciation to Publications Committee Chairman Morris M. Thompson for his complete and friendly cooperation and for his helpful suggestions and advice, to Secretary Dix for his many suggestions and for his wise counseling, to the Assistant Editors for their increasing help, to all the authors who have contributed material to SURVEYING AND MAPPING, and to the dozens of others who, in one way or another, have helped to make the Journal what it is and to make the holding of this office a pleasant and rewarding experience.

MEMBERSHIP COMMITTEE REPORT

PRESIDENT MERRIAM: The principal problems before us are definitely associated with growth and change. The first of these is primarily the result of the untiring efforts of Capt. Frank S. Borden as Chairman of the Membership Committee, and on that point, I'm wondering if we could have a word from Captain Borden on membership.

CAPTAIN BORDEN: Gentlemen, I notice that Mr. Merriam says that he would like to have a word from the Chairman, so I will try to keep it to a very few words; I can't quite condense it to one.

My report will consist of two parts: first, a brief statistical report; and second, a brief recognition of the work of many of our members who have helped us during the year, and then of one award that will be made later.

The paid membership of the ACSM for the calendar year 1953 was 3,152. This consisted of 2,902 individual members, 238 library members, and 12 sustaining members. During that same year, 575 new individual members were added, but during the same period, 358, or 13 percent of the members, were lost through death, resignation, or failure to pay dues, thereby reducing the net gain in individual membership during 1953 to 217.

Thus far, in 1954, 356 new members have been added, making our total membership, as of today, 3,245. Combining this with our library members and sustaining members, we now have very close to 3,500 members as of March 23, 1954.

In our report last year, we made the statement that we believed the loss of 15 percent of our membership each year was far too high. While this figure has now been reduced to 13 percent, we believe it is still too high. Assuming a continuous flow of 600 new members a year into the ACSM, a 13 percent loss means a saturation point in the membership of 4,600. Even an annual flow of 1,000 members would permit a membership of only 7,700.

If this 13 percent can be reduced to 10 percent, and we believe it can, the corresponding figures become 6,000 and 10,000.

The reason we believe that it can be done is that the many members who are now helping to sell the ACSM are now doing it, for the most part, by real salesmanship.

Coming to the second part of my report, the ACSM offers an award to any member who obtains 25 new members. Now, you will all, I think, recognize that it is a very difficult matter to determine just how many or by whom new members might be obtained. However, we have very definite figures on one man to whom I would like to make an award at this time.

The member to whom I wish to make this award is William C. Meek of the General Petroleum Corporation, Los Angeles, Calif. Mr. Meek has not been able to come to the meeting, but Southern California has sent a representative here and I have asked him if he will accept this for Mr. Meek, and in so doing, I would like to have Dan Whelan come up to the platform.

Incidentally, this man, Dan Whelan, deserves a membership certificate himself, but he is too modest to tell us just how many members he provided.

I think that perhaps the members would like to see just what we give as an award. This, gentlemen, is an award known as an Honorary Award. It reads "Know ye that herewith is awarded to William C. Meek an Honorary Award for services rendered to the American Congress on Surveying and Mapping for recruiting of new members, thereby advancing the interest of the profession and actively contributing to the growth and development of the organization."

I take great pleasure in awarding this to Mr. Meek and I wish you would express to him our thanks.

As I indicated before, it is difficult to evaluate the amount of praise that should be given to any member in the shape of an award because we have very many members throughout the country who are doing a fine job of selling the ACSM and obtaining new members, and for that reason, I would like to run rapidly through the names of some of these members.

(At this point, Captain Borden described the work of many individual members in promoting the interests of ACSM.)

PRESIDENT'S MESSAGE

PRESIDENT MERRIAM: Monday I intimated that Mr. Janus must have had a peculiar slant on life as he regarded it from different angles. The same is true when a new president first begins to consider the intricate problems of the American Congress on Surveying and Mapping, and gradually forms some sort of opinion which is unavoidably tempered with bias depending upon the angle at which he views these problems. It is not to be expected that a president can be blessed with an omniscient point of view, and therefore the opinions herein expressed are no more the official opinion of our body as a whole than a message from the President of the United States can be expected to be entirely in accord with the Congress of the United States of America. At best this message is but a guide to thinking, to the crystallization of opinion and, I hope, to wise action.

The principal problems before us are definitely associated with growth and change. The first of these is primarily the result of the untiring effort of Captain Borden as Chairman of the Membership Commitee, and the second is the result of the first. The progressive transformation in character of the organization has taken a most satisfactory course from a small nucleus of far sighted men connected principally with government mapping agencies so that it is now an engineering society of national and even international standing and influence.

In the fourteen years that I have been a member, I have seen the ACSM grow like a lengthening and at the same time strengthening chain joining the primary surveying and mapping activities of the Federal government with the man who at last reaches out to the citizen, whether this man be the one who makes maps for civilian use, the one who prepares maps for the military defense of the civilian, or the one to whom the civilian turns to safeguard his claim to property rights. It is in this latter branch that our membership has made its most important numerical gains, and we welcome with satisfaction the many individual land surveyors who see in the ACSM an expression of community of interest with the surveying and mapping fraternity as a whole.

Such growth imposes many responsibilities and makes necessary changes in organization. Our original Constitution and subsequent revisions become outgrown in time, and need is felt for readjustments to be more nearly in accord with present operation. Our Committee on Constitution has worked hard and long under the leadership of Chairman Pryor, and the Congress owes a debt of gratitude for the formulation of the draft which is now under consideration. There is emerging the concept of a central body with Board of Direction charged with guidance in general policy matters. To serve better the technical interests of the members, there are the six technical divisions, each largely self governing within the scope of their activities. To better serve the membership situated at a distance from Washington, local sections have been formed, three in number at present—Texas, Northern California, and Southern California—and others may be created as the demand arises. It is hoped that through more of such regional meetings as these sections may hold, our members beyond convenient travel distance from our annual meeting can be made to feel more intimately a part of the organization as a whole. In addition, provision is made for affiliation with the ACSM on the part of local organizations which retain their identity as self-governing associations, the essential requirement beyond support of the general principles of the ACSM being that at least a minimum number of their members, or a minimum percentage of their membership, must also be members of the ACSM.

While the strenuous effort which the committee has made is greatly appreciated in giving a more practical interpretation of our basic law to accord with functioning of the ACSM, the need now is for a period of calm consideration rather than immediate ratification. The continuing committee has much to study in the written comment which interested members have been kind enough to submit.

I have come to believe that the main task is to strike a balance between what might be considered the theoretical principles of democracy and the practical operation of an organization which at present is without any salaried officers or paid personnel. We have still retained our amateur standing, and until some provisions can

be made for professional aid in operation, this consideration makes necessary a seemingly close governing group with component parts within easy hailing distance. It is obviously better to have an imperfect union that accomplishes something than a more perfect one that might not function as well.

The obvious conclusion is that we have by no means reached our ultimate development, and nobody can clearly foresee what the future has in store. Eventually permanent headquarters and paid staff together with further organizational adjustments will become necessary. All that we can do at present is feel the way, realizing that perhaps sooner than we think we shall have to risk some rather important capital outlay and face higher dues to give more effective service to the members. The management has been endeavoring to conduct the affairs of the Congress as economically and wisely as possible in order to build up a reserve against the time when the inevitable step must be taken.

In the meantime, there is the problem of reaching over 3,000 members, most of whom have little hope of making personal contact with officers and committee members, or even of attending meetings. We must build progressively with this in mind, and realize our responsibility to those absent. Obviously, constitutional changes must be made, for there is nothing which cannot be improved upon. Nevertheless, before attempting to revise too drastically for the sake of improvement and attainment of a nearer approach to the ultimate, we may have to continue to alter our constitution carefully step by step, operating according to the spirit rather than the printed word, or as Shakespeare expressed it in few words—"The play is the thing."

In view of the widely dispersed membership, the annual meeting and such regional meetings as may be held, play an important part in the activities of the Congress. Constant effort must be made to make such meetings so attractive that our membership can be drawn more closely together. Excellent papers may be read at meetings, or perhaps in greater comfort at home in an easy chair, but the sociability of a gathering of this kind cannot be sent by mail. Ideas may be expressed by letter, but there is nothing that fertilizes the mind like the stimulation of association with kindred souls.

The second important element in welding a more perfect union is the work of the Publications Committee and Editorial Staff. It is SURVEYING AND MAPPING which forms the cement, and to many members it is the only tangible evidence that the Congress exists. As this chain of which I speak lengthens and reaches out to greater numbers, there is a problem of making the articles in our Journal more meaningful to a larger range of readers. I am glad to say that the idea that something can be done to make the Journal more universally appealing without loss in high technical quality is favorably entertained. I believe that we may look to a progressive step in this direction.

There are many problems which are now giving surveyors in various parts of the country considerable concern, such as licensing, advertising, social security, and ethics, to name a few. Judging alone by the volume of correspondence and minutes of meetings devoted to these subjects, there is much to be said on each side of every question.

The matter of licensing and registration is particularly confusing because of the apparent lack of uniformity not only in the framing of State laws but in faith that surveyors may have in the administration of these laws. There may be perfectly good intent to protect the public, but, if poorly administered, regulations may easily turn out to be merely political tools. Conditions vary so from one State to another that it would seem difficult for a body such as the Congress to take a stand as to what was good and what was bad. It would seem that such matters fall more properly within the province of local groups.

In general the principle of advertising seems a more clear-cut issue, but still one that cannot, in my opinion, be spelled out as yet in hard and fast terms. Furthermore, I feel that it is not wise to anticipate by prohibitive action that the unscrupulous are going to advertise unethically, but rather we must deal correctively with specific offenses as they occur hoping to prevent further cases. Of course, to distinguish when an offense is an offense, it must be necessary to formulate in our own minds what is proper and what is not. This seems to be a responsibility that falls on Sol Bauer and his committee on Professional Status.

I have recently received from Victor Ghent a nicely gotten-up printed card setting forth the code of ethics or "Canons" adopted by the Virginia group. I noticed on the mailing envelope a pertinent admonition, "Please do not bend." While there is the tendency to specify the principles of good conduct in detail, let us keep in mind the basic thought so that our acts shall not needlessly be harmful or prejudicial to others. I am reminded that when I was in Exeter the widow of a famous professor of Greek would tell

me that in her husband's day the school had but one rule, "Every Exonian was expected to be a gentleman." In this day when the complexity of life requires ever more explicit laws and prohibitions, let us not forget the essence of our ethical code that every surveyor is expected to be a gentleman.

Social security seems to be giving considerable concern. In principle, social security, as a means of enforcing some provision against the future on a public which by and large doesn't have the common sense of squirrels, is highly to be commended. There are, of course, obvious defects, primarily in the divorce between the payment of the benefit and the collection as a tax. The principle of the eleventh-hour worker seems to have guided political thinking, but that is a matter of law which we can do little about but accept as it is.

There are, however, two important facts to be considered. In the first place, as engineers our thinking should be unprejudiced by the fact that many of us, if about to be covered within a few years of retirement, will reap what we have not sown. Others, primarily the younger members of our profession, on the other hand, will sow for many years and receive no greater share of the harvest. Social security may be beneficial in bolstering the weakness of human nature but does not create wealth, so don't look upon it as "something for nothing." It is, furthermore, most important to remember that "professional or nonprofessional" status in the eyes of the tax collector has no relation to "professional or nonprofessional" status *in fact*. I have been under social security since its inception as an employee in a covered industry, but I don't consider this as in any way degrading me from professional status.

One commendable and constructive movement has originated in the Texas Section, the advocacy of a commemorative stamp for surveyors. The suggestion was regarded with favor at the last meeting of the Board of Direction. In the meantime, our Texas friends have started a letter canvass urging the members of the Senate and House committees on the Post Office to authorize such a stamp. I trust that at this meeting there will be sentiment in support of this movement.

Over a considerable period of time, as reported in the published minutes, the Board of Direction has been considering an important undertaking in the form of a consecutive meeting with the American Society of Photogrammetry. There have been many hurdles to overcome, some of which gave grave concern only to find that they were easily stepped over. There were others that seemed easy but proved unexpectedly difficult. The well considered formulation of the movement, as reflected in the minutes, has been reported to the membership through the medium of the Journal, and so it was a surprise to find misunderstanding within our own ranks a possible stumbling block at the last moment when both societies were just about to come to final agreement. For this reason I feel that it is particularly important to dispel further misunderstanding as to the plans for the coming annual meeting in 1955. Fundamentally, the two societies have areas of interest which to some extent overlap, but at the same time are by no means as coincident as might be thought. To surveying and mapping, photogrammetry is a very useful and important tool. On the other hand, to photogrammetry, surveying is but one of the many applications. There is consequently no attempt to merge or combine the two organizations, but rather to take advantage of the common ground to permit members interested in both societies to take in the desired features of both meetings all for one trip to Washington. There is also the possibility of profiting by better exhibits, because this plan certainly appeals strongly to the exhibitors, many of whom have either to set up twice, or else decide which of the two they can afford to attend.

Plans are under way for such a consecutive meeting this coming March, Photogrammetry taking the first half of the week and Surveying and Mapping the second. It was recognized at the outset, and long before final ratification, that the success of any such undertaking would be dependent upon guidance from a committee understanding the problems of both societies and with actual experience in the operation of meetings of both societies. On the chance that plans would be ratified, President Lundahl and I "captured" the man who all agreed was the *sine qua non* and obtained his assent to serve if wanted. Consequently, I feel certain that under the advice of Marshall Wright and the men of experience he will gather into his advisory committee, all fears may be allayed.

I am particularly anxious that the ACSM shall take a progressive part in technical advances and formulate clear thinking in professional development. I consider therefore a most significant part of the activities of the ACSM as a whole the proceedings of the technical divisions.

In closing I want to pay particular tribute to your Executive Secretary Dix, and express my appreciation for the many stimulating conversations I have had with him in his office or over a bowl of soup at the cafeteria. I have been greatly impressed with a remarkable talent that I have observed in him, the ability to know the outstanding strong points in so many personalities and to deploy so effectively the forces upon which depend the strength of the Congress. Personalities, as we are well aware, differ markedly, and it is necessary to take into consideration these differences, but the one outstanding thing that I have noticed is that in our many discussions I cannot recall one person for whom he has not some word of praise and commendation. It has been a delight to have had the opportunity to deal with a man of such unusual nature.

I feel confident that the progress this organization has made will continue, but I am sure that, as its problems unfold, I can truthfully say that one's education never ends.

SECRETARY'S REPORT

MR. DIX: Mr. President, members, by the time all of the committeemen and officers of the Society have given their remarks, they have just about covered most of the activities of ACSM. I will endeavor to fill in a few gaps, so bear with me as this may be slightly halting because I have to eliminate repetition.

I would like to make one point on our constitution, in deference to our past chairman, Mr. Pryor. We get suggestions and criticisms, and one of the questions that comes in occasionally is "Why does the Committee arrive at the decisions they do," and one is a point of a quorum. If you will consider that we are now in a quorum session for a national society, you can see the reason why we do not demand five or six hundred members present or we could not hold a meeting. But, we are used to that in Washington because our United States Congress operates very much the same way. It is only necessary to have a quorum on hand for certain important legislative matters, parliamentary matters, but it is the reason why in the wisdom of the Constitutional Committee, we keep the quorums low and we are forever criticized because we don't call for larger quorums. I believe this proves that point.

In the matter of the sectional activity and the commemorative stamp drive which was started by our good member, Mr. Boyles from the Texas Section down in the largest of all States till they let Alaska in, may I make a personal request to individuals and groups to write letters to your U. S. Congressmen to get behind that move. Some of the societies and organizations have already done so, but you can also do so as individuals.

On the matter of sectional activity, two formative movements are currently taking shape; the one in the Rocky Mountain area and, of course, previous speakers have already mentioned the Great Lakes Region.

Down in New Orleans they are about ready to come up with a parcel of members and get a section started down there. A little explanation is in order of the affiliation versus the chapter, section, or the local surveyor group organization. Property surveyors are, in some States, already licensed or registered and it is hoped, of course, that some day they will be in all the States. In their own pertinent behalf, as licensed or registered surveyors, they must organize, theoretically, to deal with their State problems, especially their State registration or legislative problems as land surveyors and as registered surveyors of some sort. That limits their membership to such registered surveyors. They find in operational activity that they must deal with engineers and various people that are not qualified to be members due to the restrictions but they would like to be interested participants of some sort, so there in that case comes the broader aspect of an ACSM section.

In between that, of course, is the provision in our Constitution for affiliation, and that affiliation is merely that of the old three musketeers—all for one and one for all. There are no dues, no obligations—just mutually going down the road together—and as it pleases the objective mutually for each organization, well then we offer reciprocal support.

We had a meeting on Monday in which the Texas group, the Louisiana group, and the South Carolina group were discussing this very matter which is the reason I'm taking your time now both to explain it to those present and to get it in the record for others to see, and it is perhaps an explanation of why we seem to have so many possibly overlapping arrangements of organization. President McMahon of the Michigan Society of Registered Land Surveyors explained to me last night that they would like to have association with college professors who cannot join their Registered Land Survey Group, and with title engineers, city engineers, and municipal engineers. They find that on Bill Williams' suggestion of the formation of this

Great Lakes Group under the Section set-up of ACSM, they would be tooled up to handle almost any situation that arises. I believe (Secretary Dix addressed Mr. Wilson, Mr. Morse, and Mr. Palmer) that explains very much what we were talking about the other night. (The Texas and South Carolina gentlemen nodded assent.)

We have three new affiliations that need only to be approved after eight o'clock this evening at the Board session, the petitions having been found in order by the Membership Committee and the Constitution Committee. They are the Wisconsin Society of Surveyors, the East Massachusetts Association of Professional Engineers and Land Surveyors, and the Surveying and Mapping Section of the Florida Engineers Society. They will be affiliates of our society.

An announcement has already been made about the 1955 ASP-ACSM meetings—I would like to announce that we have already, in joint cooperative action of the two societies, both nominated and appointed the General Coordinator for those meetings, and this is Marshall S. Wright, who is a past president of both societies. We are organizing a technical advisory board for that meeting and plan to have key chairmen who have chaired meetings of both societies, augmented by experts who have conducted meetings of either society. We aim to have a very strong advisory and controlling group in this very important cooperative effort and, believe me, it takes a lot of both cooperation and effort.

I remind you all again, as our good President already has, that we are a volunteer-operated group and all the work in the divisions and in the committees, in the secretariat, getting out the Journal, is done by either the love of hard work or being stuck with it with no escape, loyalty to the job when no takers are on the relieving end; but, nevertheless, the organization spirit, the reception of our Journal by the members, the reception of our meetings by the members, your attendance here, are in the spirit of ACSM; it is wonderful and it pays us back.

I want at this time to apologize to all those very patient members throughout, not only this year, but all the years, who I feel occasionally I personally neglect, even lose their mail; some of their requests perhaps never get answered, probably get buried and we find them a year or so too late to answer, but who are so understandingly patient and bear along with us year after year, and it makes the job worthwhile.

I thank you for it, and want you all to come back next year.

PRESIDENT MERRIAM: I want to say again that I am looking forward to the remaining months of this calendar year and I'm hoping to get around to seeing some of the local groups and being with you.

These associations have been very dear and I know that Mrs. Merriam appreciated being here and the very gracious and kind things that you have said to her. I also wish to express appreciation for the work that Mrs. Berry has done and how well she has handled the ladies' program.

Now, if there is nothing further from the floor, we will call the meeting adjourned.

(Whereupon the meeting adjourned at 4:15 p.m.)

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Topography Division

At a special session of the Board of Direction of the Topography Division, the unopposed slate of nominated candidates was adopted by resolution and the candidates appointed to office.

The Chairman for the year remains in office until the annual meeting in the year following in order to arrange for the program and to preside during the Division sessions at the meeting. The Directors serve on a calendar year basis with terms expiring on December 31.

The officers for 1954 are:

Earle J. Fennell, *Chairman*

Directors

Ford Bartlett (1 year term)
Charles A. Schanck (1 year term)
Jon S. Beazley (2 year term)
Charles W. Buckey (2 year term)
Carl J. Alster (3 year term)
Lloyd E. Marsden (3 year term)

Mr. Fennell will make a more complete report on Division activities and objectives in the next issue of the Journal.

Northern California Section Takes Action on Professional Policy

On January 13, 1954, the following communication was presented at a hearing before the California State Senate Interim Committee on Licensing Business and Professions:

Gentlemen:

On January 12, 1954, the board of directors of the Northern California Section of the American Congress on Surveying and Mapping met and endorsed the statement which follows and directed that it be submitted to you at the hearings to be held on January 13 and 14 on the subject: Mapping by Photogrammetry.

THE STATEMENT

The Northern California Section of the American Congress on Surveying and Mapping is an organization of approximately 100 northern California mapmakers, map users, photogrammetrists, engineers, and surveyors banded together to:

1. Advance the sciences of surveying and mapping in their several branches, in furtherance of the public welfare and in the interests of both those who use maps and surveys and those who make them, and to establish a central source of reference and union for its members.

2. Contribute to public education in the use of surveys and maps and to encourage the prosecution of basic surveying and mapping programs, especially those programs which are paid in whole or in part with public funds.

The Northern California Section does not wish to express itself as to the interpretation of the existing land surveyors' act or civil engineers' act, nor does it wish to comment on the legality or competency of individuals or corporations who, though not registered as civil engineers or licensed as land surveyors in California, have been providing maps for engineering purposes.

The Northern California Section does believe:

1. That to promote the advancement of the sciences of surveying and mapping in their several branches, and in furtherance of the public interest of those who use maps and surveys, maps made for engineering purposes and other exact uses should be prepared by and under the supervision of professional men using what are commonly considered to be professional ethics and professional attitudes regarding the performance of their task and being compensated for such performance by professional salaries and fees arrived at in a fair and considerate manner.

2. That because registration or licensing is recognized throughout the United States as a means of protecting, promoting, and controlling this professional atmosphere not only in engineering but in medicine and law as well, those preparing maps for engineering purposes and other exact uses should be registered.

3. That a knowledge of the uses to which maps are to be put is necessary to determine their competency and that for the supervision of preparation of maps for engineering and other exact uses a knowledge of engineering and land surveying is necessary.

4. (a) That an incompetent map at any cost or price is an overly expensive map.

(b) That expert, highly trained and skilled personnel necessary for any single operation of map preparation are not necessarily qualified to judge overall map competency for the purposes for which it is intended.

(c) That perfect specifications cannot be written governing the competency of a map and such competency must depend on the knowledge, experience, and integrity of those supervising the preparation of such maps.

5. That, here in California, the existing civil engineers' and land surveyors' acts are adequate to cover the preparation of such maps. Since it is the policy of the Board of Registration for Civil and Professional Engineers to provide optional examinations in certain major fields of civil engineering, a Surveying and Mapping option should be made available on the same basis as the other options.

Sincerely,

LOGAN N. MUIR, JR., *President*
Northern California Section
American Congress on
Surveying and Mapping

Texas Section

The twelfth meeting of the Texas Section of ACSM was held March 5, 1954, in the auditorium of the Houston Lighting and Power Company, Beatty Service Center Building. Seventy-seven members and fifteen visitors were present.

The meeting was opened with an automatic roll call by Chairman Wilson followed by an announcement of the new committee chairmen appointments. The commemorative surveyors stamp committee, composed of J. Stewart

Boyles, O. E. Young, and Joe A. Hicks, Jr., announced that the committee has been requested by the national chapter to spearhead the campaign toward the issuance of such a stamp.

Treasurer R. K. Dailey gave a financial report as of March 5, 1954, which showed an amount on hand of $537.51. Each member was urged by R. L. Sargent, Chairman of the Membership Committee, to go all out in the procurement of new members.

After the introduction of guests and a cordial welcome was extended to all visitors, Chairman Wilson turned the meeting over to V. A. Walston, Chairman of the Program Committee. Mr. Walston introduced as speakers Lt. Comdr. H. D. Reed, Jr., Coast and Geodetic Survey, and Robert A. Vines, Director of the Houston Museum of Natural History.

Lt. Comdr. Reed presented a film showing the activities of the Coast and Geodetic Survey and gave a lecture on "Level Work by USC&GS in Harris County and Adjacent Area," which dealt with procedures of first- and second-order leveling as performed by the USC&GS. Lt. Comdr. Reed mentioned in his discussion that releveling of old bench marks was required due to settlement within the area of Texas City and Houston. He gave interesting procedures of leveling in trying to obtain a first-order closure across the waterway between Galveston Island and Bolivar on High Island, a distance of more than two miles. Lt. Comdr. Reed also pointed out that new benchmarks from Fairbanks to Hempstead, south to Katy Road, were being established and unadjusted copies of the work would be available soon.

A precise level and rod, as used in the work of the Coast and Geodetic Survey, was on display during the meeting. After his lecture, Lt. Comdr. Reed explained the handling and use of these instruments.

"Identification of Trees Native to East Texas and the Gulf Coast Region" was the subject of Mr. Vines' lecture, which was accompanied with slide illustrations. Mr. Vines discussed how many of our native trees were misnamed and explained the efforts of the Botanical Society to give like trees of various regions the same names to avoid confusion. He also enumerated the difficulties encountered trying to convert the local populace in the usage of proper names for trees.

The status of the Texas Surveyor's Association progress on the Surveyors Licensing Law was given by E. D. Morse.

The officers and directors of the Texas Section of ACSM convened on April 13, 1954, at the Electric Building, Houston, Tex., with Chairman W. H. Wilson presiding.

An intensive membership drive was discussed with eagerness and enthusiasm, and organized on a "zonal" basis. As our State of Texas comprises "most" of the United States, we have a potential membership of additional hundreds who will be instrumental in the progress of the surveying and mapping profession.

The date for the thirteenth meeting of the Texas Section, ACSM, has been set for May 20, 1954, at which time Mr. Alvis Vandygriff of Austin, Tex., attorney for the Texas Surveyors Association, will address the Texas Section on the proposed Public Land Surveyors Registration Act.

HARRY L. WEST
Section Editor

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Handbook Committee Requests Assistance

The Vice Chairman of the Property Surveys Division, Gordon E. Ainsworth, has accepted the task of developing a chapter for the Property Surveys Division Handbook dealing with the original methods of subdivision of lands in the various parts of the United States. For this task he will require the assistance of members throughout the United States who can furnish him with local historical data dealing with this subject.

Copies of such historical data, or references to books in which such data may be found, will aid greatly in the development of this important chapter of the Handbook. Members are urged to send such material as they may have to Gordon E. Ainsworth, 2 Graves St., South Deerfield, Mass.

SOL A. BAUER, *Chairman*
Handbook Committee,
Property Surveys Division

Recognition of Surveyor on Site Plans

Architects and architect-engineers generally recognize the value of an outline or topographic survey as the basis of good site plans. It has been a source of difficulty for surveyors for some time, however, in that so often surveys are used in this manner, without indicating the source of the information, or crediting the surveyor with his work. Not only is this practice unfair to the surveyor, but it is also unwise on the part of the architect or architect-engineer, in that, without such recognition, he places himself in the position of assuming responsibility for survey work over which he probably had no control, nor legal jurisdiction.

Marked progress has been made recently by the Professional Status Committee of ACSM through discussions of this matter with the Cleveland Chapter of the American Institute of Architects. The president of that chapter, Joseph Ceruti, architect, agreed whole-heartedly with the attitude expressed by our Committee, and brought the matter before the Executive Committee of his chapter. As a result, on January 21, 1954, the Executive Committee of the Cleveland Chapter of A. I. A. passed a resolution to the effect that "the architect attribute the survey information to the responsible source on his site plans; placing the responsibility on the proper party and giving recognition for the professional service."

Such acts of cooperation and understanding between architects, engineers, and surveyors are marks of progress. It is to be hoped that this action on the part of the Cleveland Chapter of A. I. A. will serve to encourage other groups to take similar action.

S. A. BAUER, *Chairman*
Professional Status Committee

Personals

E. D. Morse, who was chairman of the Texas Section of ACSM in 1953, has recently become president of the Texas Surveyors Association. Mr. Morse, who is a Civil Engineer with Houston Lighting and Power Co., leads a very active life in engineering circles. Besides affiliations with TSA and ACSM, he is active in the American Society of Civil Engineers, Texas Society of Professional Engineers, and Houston Engineers Club.

Charles O. Greenwood, Jr., Civil Engineer, has moved to new offices at 2321 Twenty-first St., Sacramento 18, Calif.

Dr. Jerzy M. Zarzycki has been named technical advisor in photogrammetry and geodesy for Canadian Aero Service, Ltd., 348 Queen St., Ottawa. Before joining the company a few months ago, he was with the National Research Council of Canada. Dr. Zarzycki will aid Canadian Aero Service's air topographic mapping and Shoran operations, as well as carry on certain research activities for them.

M. Henri Peltier, President of the Order of Land Surveyors (Géomètres-Experts) of France, was decorated with the French Legion d'Honneur, April 8, 1954.

In announcing the naming of Reserve Captain Peltier as an officer of the Legion of Honor, which is a military title of distinction, the Revue des Géomètres et Topographes Francais points out that the honor was bestowed in large part in recognition of services as a civilian over many years.

L'Ordre des Géomètres-Experts is justly proud of the high honor reflected on the profession by its distinguished president. For the surveyors of America, the American Congress on Surveying and Mapping congratulates M. Henri Peltier, Surveyor and Officer of the Legion of Honor.

Edward I. Loud, Jr., Chief of the Control Planning Unit, Photogrammetry Section, of the Geological Survey's Atlantic Region office, died on April 1, 1954, at his residence in Arlington, Va.

Mr. Loud was well known in photogrammetric circles for his many contributions to both the theoretical and practical aspects of the science. Among other achievements, he devised equipment for economically copying and transferring map sheet edges, for checking map detail against

photographs, and for printing Kelsh plotter diapositives. Mr. Loud contributed materially to the improvement of multiplex equipment with his many suggestions. On several occasions, his work was recognized by cash awards from the Interior Department's Incentive Awards Committee.

Mr. Loud was the author of the chapter on "Multiplex Operation" in the new Manual of Photogrammetry published by the American Society of Photogrammetry. A large number of photogrammetrists now active in the profession received their original training under Mr. Loud's supervision.

Born in Weymouth, Mass., in 1916, Mr. Loud was graduated from Tufts College in 1937 with the degree of B.S. in Civil Engineering. He was employed by the Massachusetts Department of Public Works for one year, and joined the Geological Survey at Chattanooga, Tenn., early in 1939. In 1941, Mr. Loud was transferred to Arlington, Va., where he was continuously employed until his death.

Mr. Loud was a member of Tau Beta Pi, the American Society of Photogrammetry, and the American Congress on Surveying and Mapping.

The ACSM regrets to announce the sudden passing of one of its members, the greatly esteemed Secretary-Treasurer of the Canadian Institute of Surveying and Photogrammetry, and Editor of *The Canadian Surveyor*, W. L. MacIlquham, who died in Civic Hospital, Ottawa, on April 6. A full account in memoriam will be given in the next issue of *The Canadian Surveyor*.

In this connection, the Institute has requested that all mail for the Canadian Institute of Surveying and Photogrammetry or for *The Canadian Surveyor* be henceforth addressed to P. O. Box 57, Westboro, Ontario, Canada.

* * *

PRE-CONVENTION JOURNAL

Advertising Tie-in Opportunity

The next Annual Meeting of the American Congress on Surveying and Mapping will be held March 7–11, 1955.

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Fiftieth Anniversary Meeting of the Association of American Geographers

THE Association of American Geographers, founded in Philadelphia in 1904, held its fiftieth anniversary meeting in that city, April 12 to 14, 1954. The program included two general sessions, on "Breaking New Ground in American Geography," and "Problems in the Geography of the United States," and a number of group sessions which featured papers on various aspects of geographical research. The cartography section, with Erwin Raisz presiding, included the following papers:

"The Changing Concept of Maps Through History," Erwin Raisz, Visiting Professor, Clark University

"The Child Looks Upon the Map," Mamie L. Anderzhon, Oak Park, Ill.

"The Public Attitude in the United States Toward Maps," Arch C. Gerlach, Library of Congress

"Visual Interpretation of Value Symbols on Maps," Robert L. Williams, Yale University

"Experiments with Some Symbols and Map Projections," J. Ross Mackay, University of British Columbia

"Psychological Aspects of Cartography," Jesse Orlansky, Dunlap & Associates, Stamford, Conn.

At the annual banquet on April 14, the retiring president, Dr. J. Russell Whitaker of The George Peabody College for Teachers, delivered an address entitled "The Way Lies Open." Dr. Homer L. Shantz, retired plant geographer of the Department of Agriculture, received the Association's Outstanding Achievement Award. Citations for Meritorious Contribution to the Profession were received by Dr. Francis Marschner, Department of Agriculture; Dr. Raymond E. Murphy, Clark University; and Dr. J. Wreford Watson, Canadian Geographical Bureau.

WALTER W. RISTOW

Notice to Annual Meeting Exhibitors

The 15th Annual Meeting and Exhibit to be held next year will have greater impact and attendance appeal than any previous meeting. The combined influence of two great annual conventions closely associated in their fields of interest—the consecutive meetings of the American Society of Photogrammetry and the American Congress on Surveying and Mapping—which have been scheduled within the single week of March 7 to March 11, 1955, with a coordinated co-exhibit planned for the full week, is expected to result in increased exhibit interest.

The sustained week of single exhibit scheduling before the dual attendance potential of both societies normally in separate conventions will undoubtedly stimulate exhibitors toward elaboration of displays and demonstrations. An additional incentive will be the expected increase in attendance by impetus of the dual drawing power in attracting many who heretofore have had to choose between attending one or the other, and those whose divided interests were not sufficient urge to attend either one.

Make Plans Now for 1955

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I am interested in surveying and mapping and hereby apply for membership in the American Congress on Surveying and Mapping. I enclose $5.00 (U. S. and Possessions), $6.00 (Foreign) in payment of annual dues.

Name (Please type or print) .....

Mailing Address .....

Occupation and Organization .....

Branches of surveying and mapping preferred .....

Reference. If registered, please indicate .....

*Why Join a Professional Society?**

JAMES F. FAIRMAN, Pres., N. Y. State Soc. Professional Engineers

"Why should I join your Society? What will I get out of it?"

You and I have heard these questions so many times that their repetition sets up in us a pardonably belligerent reaction. I know my answer is belligerent. I reply, "Not a damn thing more than you put into it." Unless the abruptness of that answer terminates the conversation, and it usually does not, there is opened up an opportunity for some straight-forward, down-to-earth discussion of the whys and wherefores of any professional organization, in the course of which I express my conviction that membership in an organization such as ours is an opportunity for service rather than a place in the bread line. As the discussion proceeds, agreement is usually reached that the individual owes a great deal more to his profession than the profession owes to him.

Having won that round, the next one begins with a feint by my opponent who advances the statement,

"Yes, but I cannot afford to pay dues in more than one society."

I come back something after this fashion, "My friend, your income and your disposition of it are none of my business but have you ever stopped to figure out what percent of your income you return in the form of dues to professional societies, and have you ever contrasted that with the annual cost of your cigarettes or whatever vices or pleasures you indulge in? Do you place a value on your profession adequately represented by your dues? Suppose it becomes necessary for you to belong to a union in order to practice your profession, what do you think your dues would be and what would you get for them? In the meagerness of the dues we pay to our professional societies, do we not ourselves set our own values on our professional organizations and if we do not value them any higher, why should we be surprised if the public places no higher value on our profession?"

The final obstacle raised by many sincere persons may be stated in this manner,

"Yes, I agree with all you say, but I have a great many other irons in the fire and I do not like to belong to any organization in whose affairs I cannot actively participate."

That statement deserves a softer answer. I say, "My friend, I understand and sympathize with that point of view, but I think it is fallacious. True, you and I cannot participate actively in every organization, we cannot spread ourselves too thin and still be effective, but some of us can concentrate our efforts on one and some on another of these activities; and all of us should support by our dues and by our votes, to which membership entitles us, the constructive programs of every organization striving to advance the profession of which we are a part. If you cannot give of your time and effort, you can give your name and your money to this work, and perhaps when you know more of what we are trying to do and see more clearly its importance, you will find the time actively to give us a hand."

* Reprinted (in part) through the courtesy of the *American Engineer,* March–April 1943.

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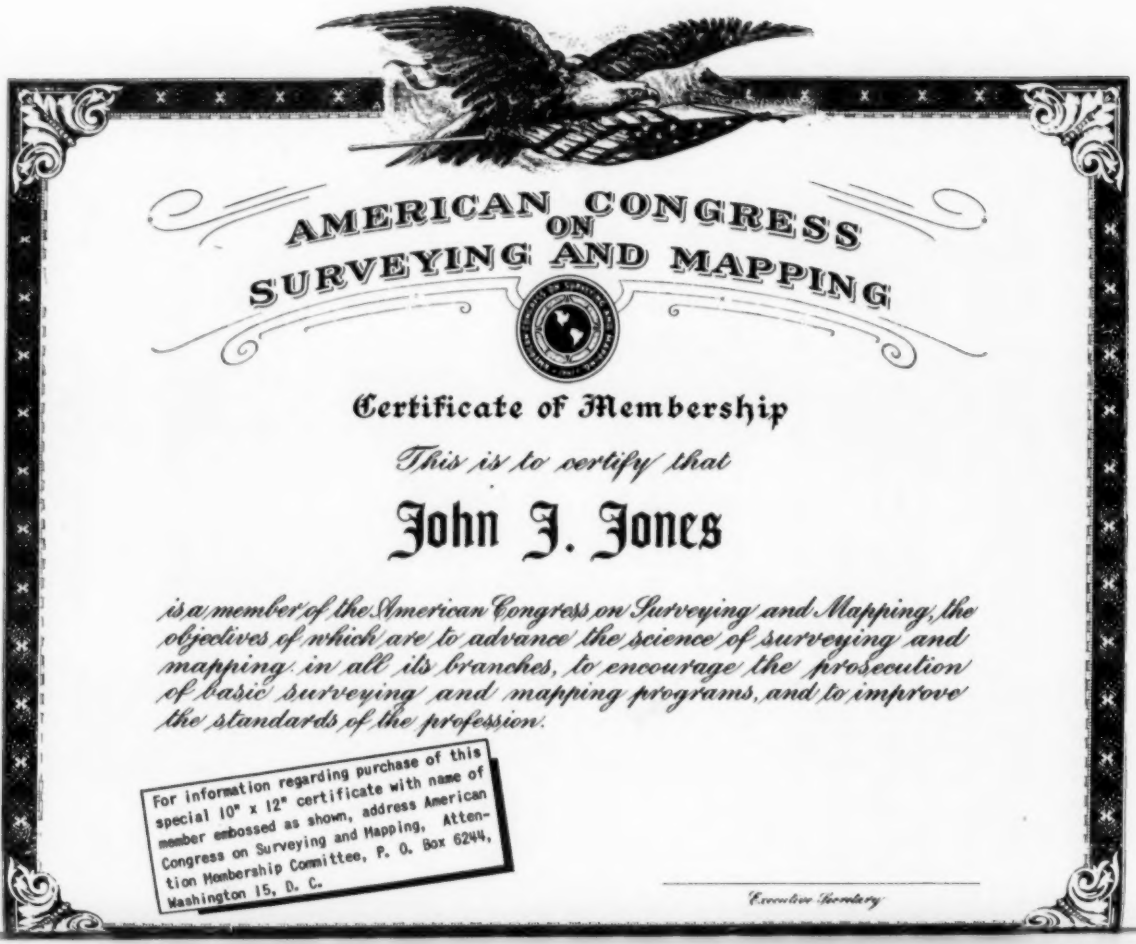
Will You Help?

If you are in agreement with the reasoning presented by Mr. Fairman in the argument quoted above, please send this page to someone you feel should be a member of the American Congress on Surveying and Mapping, or drop a note to the Chairman, Membership Committee, P. O. Box 6244, Washington 15, D. C., requesting that membership information be furnished the prospective member.



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This is to certify that

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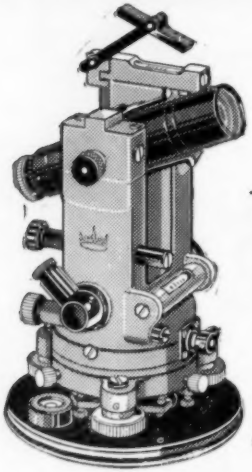

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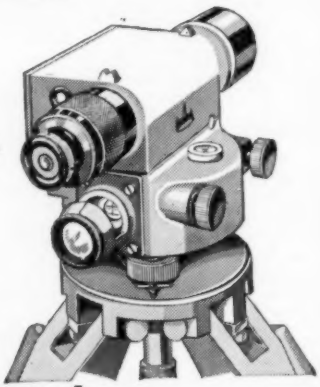

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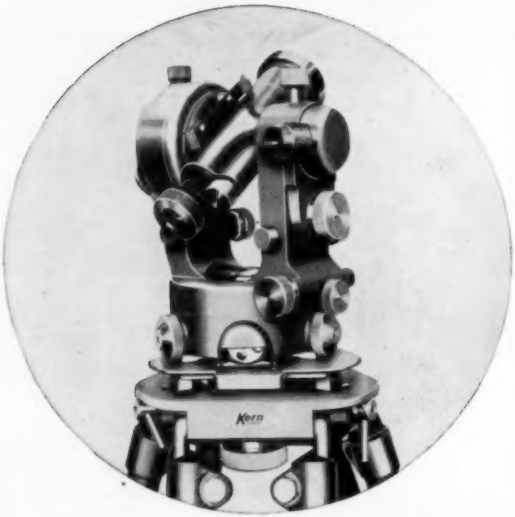

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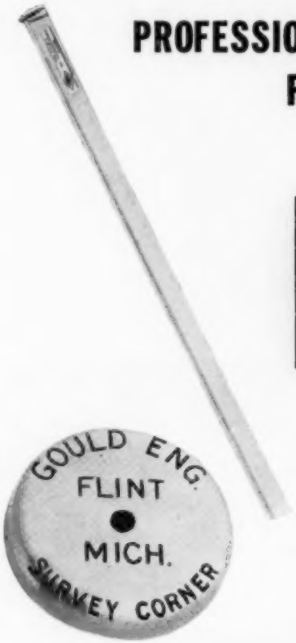

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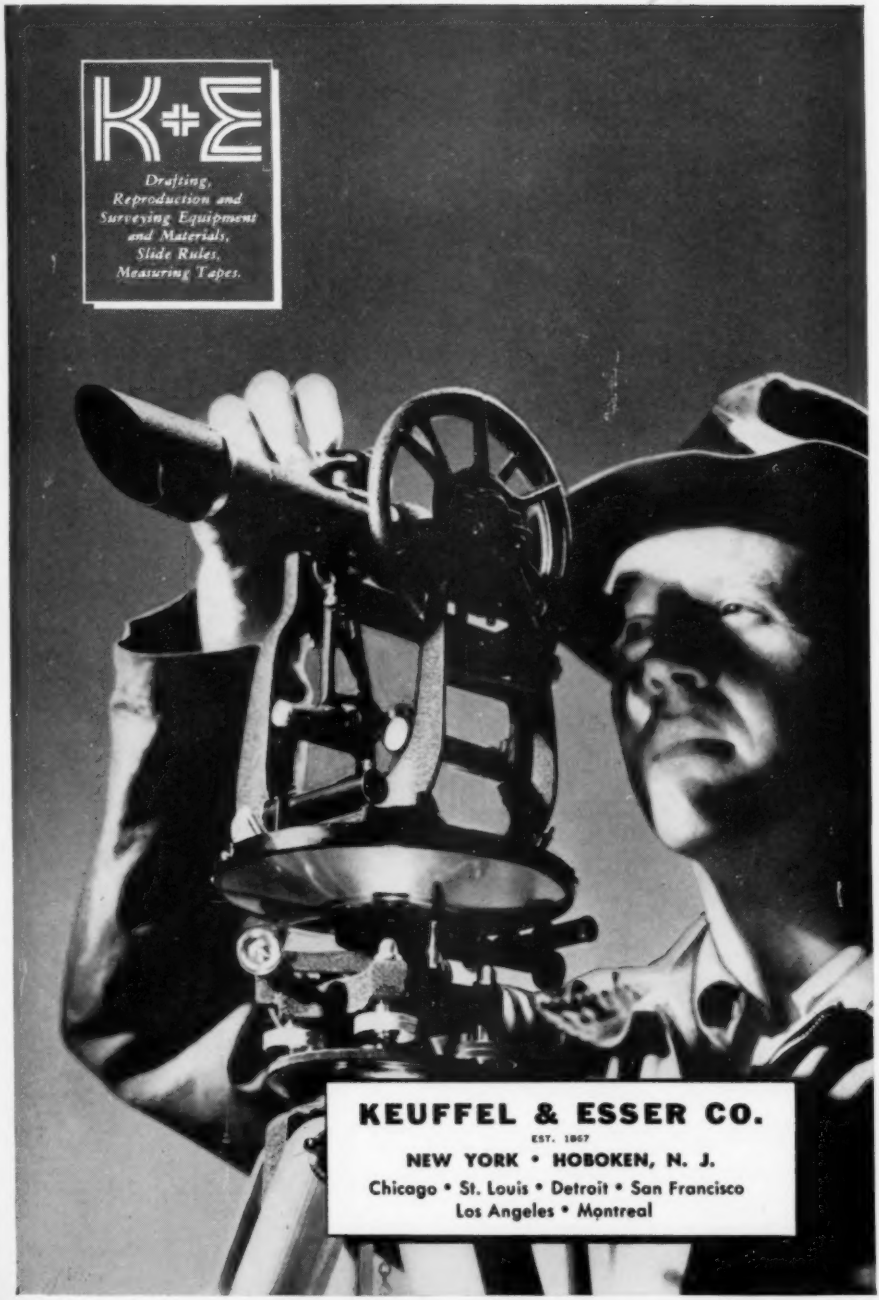
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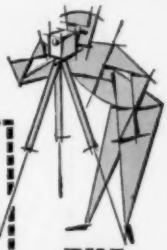

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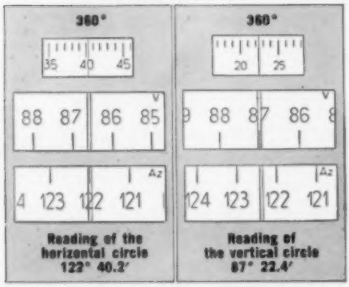

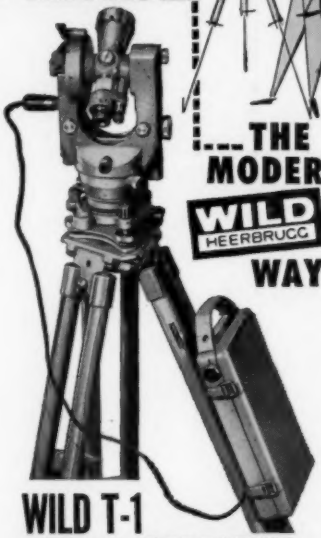

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